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# JP WIND INNOVATION FORUM REPORT

Amsterdam, 11-13 September 2023

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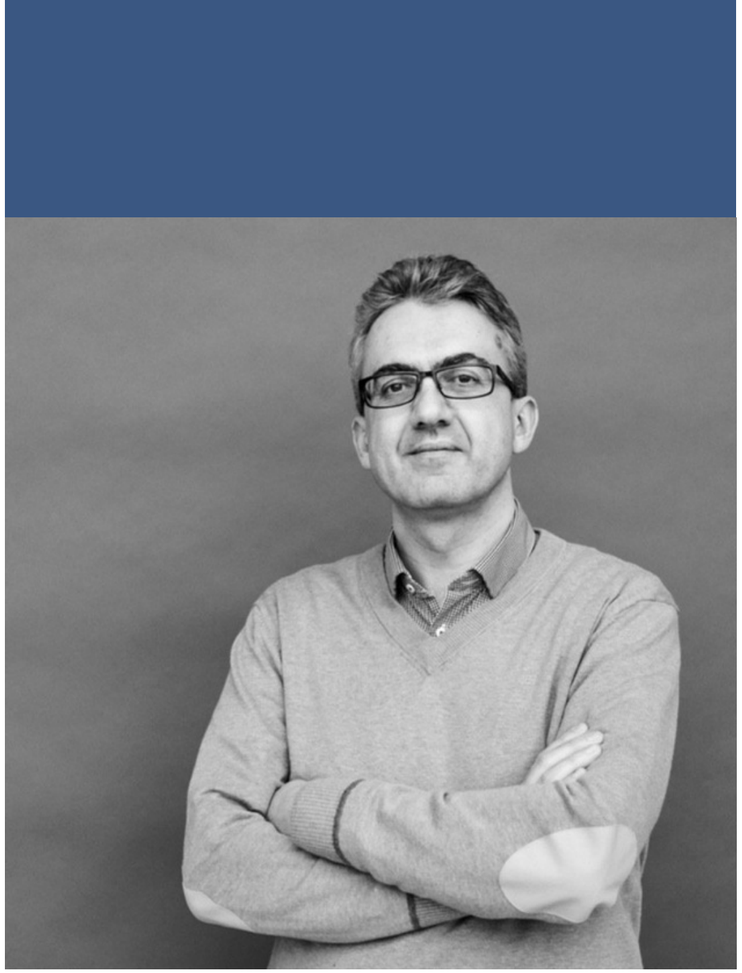


In 2023, JP Wind achieved notable milestones, underscoring its central role in wind energy sector research. Firstly, the launch of the NeWindEERA project, financed by JP Wind own funds, demonstrated a strong commitment from its members to establish a comprehensive research program for wind energy. Secondly, ongoing dialogues with ETIPWind and WindEurope highlighted the valuable collaboration between JP Wind and industry stakeholders, emphasizing a coordinated approach to short-term and long-term objectives in wind energy. The close partnership with ETIPWind resulted in an agreement to merge the Strategic Research and Innovation Agenda (SRIA) with the NeWindEERA research program, providing a unified voice to amplify their collective impact. Additionally, the introduction of the new website created a valuable platform for knowledge exchange and networking, complemented by the consistent success of monthly webinars. The substantial participation in the JP Wind Innovation Forum this year, with over 100 registered attendees, underscores JP Wind's effectiveness in convening experts and leaders. Lastly, the signing of a Memorandum of Understanding (MoU) by nine JP Wind organizations to develop EuCoE4W demonstrates a shared commitment to drive advancements in wind energy and ensure research has a tangible impact on industry solutions

**Ignacio Marti**

**DTU**

Coordinator of EERA JP Wind

ETIP Wind

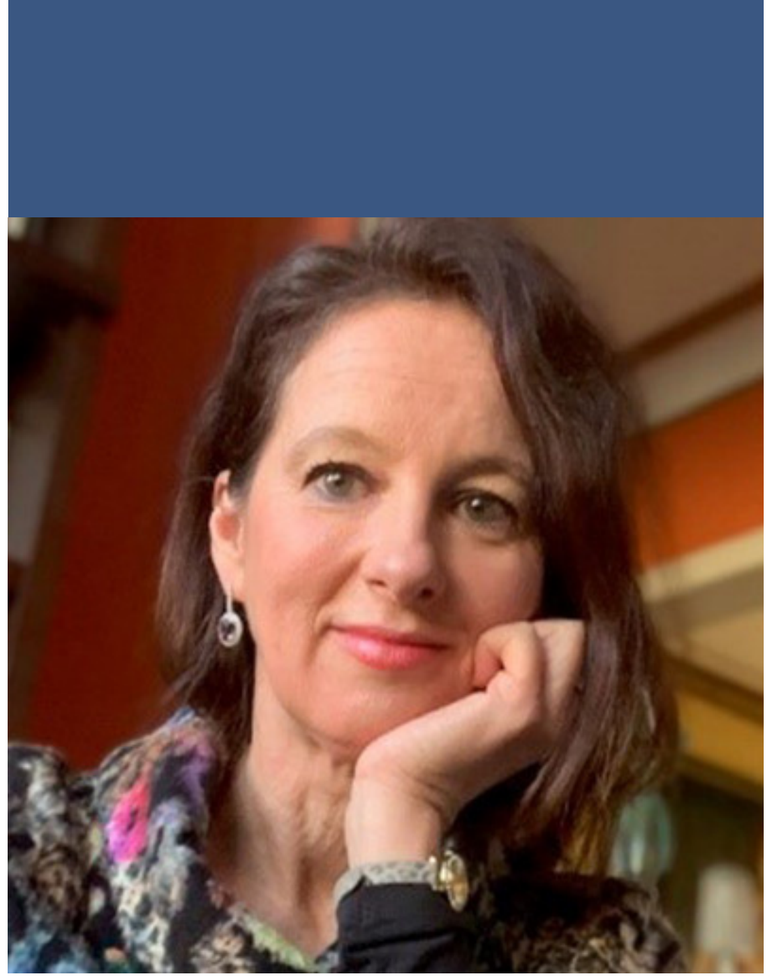
EUROPEAN TECHNOLOGY & INNOVATION PLATFORM ON WIND ENERGY

The main priority of the wind industry is now to accelerate the deployment of wind energy in Europe. EU needs to double the rate of wind deployment from 16 GW per year to 30 GW per year. Research & Innovation (R&I) across the value chain is cornerstone to achieve this. It has the power to enable faster deployment, more annual wind energy production but also more reliable wind power. By contrast to this big challenge, the EU doesn't invest enough in wind energy R&I. Only €82million were dedicated to wind energy in the last Horizon Europe Work Programme 2023-2024. EU Investment should increase to address the challenges the industry is facing. And the mission of ETIPWind is to provide recommendations on the R&I priorities that need to be publicly funded. Guided by its Steering Committee, ETIPWind identified 5 key challenges the wind industry faces today: Wind energy system integration, Industrialisation, scale-up and competitiveness, O&M and Digitalisation, Sustainability & Circularity and Skills and Coexistence. Those challenges can only be answered thanks to a close collaboration between industry and research. The collaboration already exists but it should be intensified and research should strive to support industry's long-term strategy and short-term innovation needs. Without these joint efforts, achieving a 100% renewable based power system by 2050 won't be possible. That is why ETIPWind is already working with EERA's JP Wind on a joint R&I agenda to be published end of November 2023.

**Adrian Timbus**

**Hitachi**

Chair of ETIPWind Steering Committee



The importance of wind energy for Europe is reflected in our latest policy priorities.
The repower EU plan, which aims for the EU to become independent from the import of Russian fossil fuel well before the end of this decade, such as objective to deploy an installed wind energy capacity of 510 gigawatts in the EU by 2030.
This is a huge increase compared to the current situation: to reach this repower EU target, we envisage that wind energy share of the EU electricity mix will grow from the current 15% to around 35% of electricity generation by 2030 and even up to 50% in 2050.
In this context, I suggest you continue the fruitful collaboration with different wind energy actors like ETIP wind, in particular to strengthen the collaboration with the wind Implementation working group contacts with the members of the Horizon Europe Program Committee
Let me congratulate JP wind community for the excellent cooperation and strategic leadership in the sector so far. I welcome the future ambitions to set up a Center of Excellence and I believe that the signature of the Memorandum of Understanding is an excellent step forward into that direction with innovation as our compass and the winds of research at our back, we will propel Europe to a greener and more sustainable future.

**Rosalinde van der Vlies**

**European Commission**

Director of Clean Planet, DG RTD


CLICK HERE FOR THE VIDEO

Nine members of EERA JP Wind signed a Memorandum of Understanding to establish a **European Center of Excellence on Wind energy** (SINTEF, DTU, ForWind, TNO, Fraunhofer, CIEMAT, ORE Catapult, CENER and NTNU) in Amsterdam during JP Wind Annual Event last September

The ambition of the European Centre of Excellence is to **strengthen Europe's long-term leadership in wind energy research** through effective coordination, collaboration, and funding leverage. Activities are expected to include collaborative research projects within a co-funded research programme

# Signature of MoU for a European Center of Excellence on Wind Energy

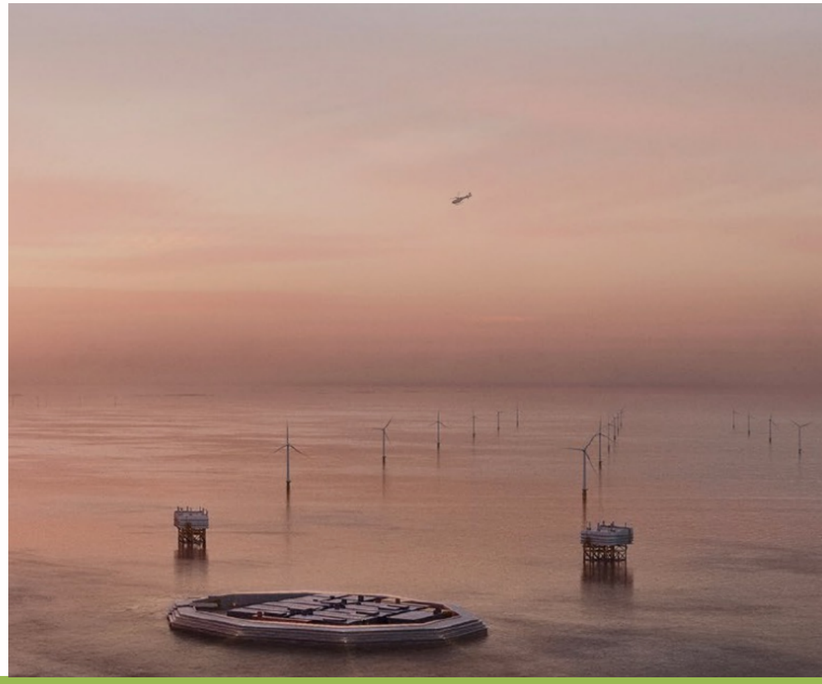
**Session chair :** Peter Eecen (*TNO*)
Contributions from Jacob Edmonds (*Ørsted*), Vibeke Stærkebye Nørstebø, (*SINTEF Ocean*), Lena Kitzing (*DTU*) and Pål Coldevin (*RWE*)

The presentations and discussion in the session focused on the sustainable development in all its aspects. Starting from the aim to reduce greenhouse gasses by production of renewable electricity, through co-existence and fair principles towards environmental impact. The presentations gave insight in the perspective of developers and researchers on sustainable development. These were quite aligned and recently tender requirements even stimulates the execution of environmental research programmes together with the development of offshore wind farms. It is recognized that the development of wind energy goes parallel with the better understanding of the impact to the environment. Caution is required, as well as the execution of well-organised and targeted research programmes. The international collaboration should be enhanced and the Centre of Excellence could play an important role in the coordination and alignment of national efforts to understand and mitigate the impact of wind farms on the environment.


# Sustainable development

**Session chair :** Tuhfe Göçmen (DTU)
Contributions from Alan Croes (Tennet), Jacob Østergaard (DTU), Adrian Timbus (Hitachi), Nenad Keseric (Statnett) and Dirk van Hertem (KU Leuven)

The concept of an offshore grid in wind energy presents an exciting opportunity to harness the abundant renewable resources of the North Sea, transforming it into a powerhouse for North-West Europe. Over the next three years, the primary target is to establish a well-defined grid that not only meets the energy demands of the region but also maximizes its socio-economic value. This involves several key initiatives, including determining a comprehensive North-Sea strategy especially towards energy islands, identifying demand and flexibility hotspots, initiating the permitting process for energy corridors, designing a dynamic and responsive electricity market, and securing a robust supply chain. To achieve these goals, offshore innovations are driven, focusing on the evolution of standards. These innovations include a HVDC platform standard, a cutting-edge cable system, multi-terminal readiness for increased efficiency, and a pioneering direct link to offshore wind parks. With these advancements and a strategic approach, the offshore grid in the North Sea is poised to play a pivotal role in the sustainable energy landscape, enhancing socio-economic benefits and promoting regional energy security.



# The future offshore grid

**Session chair :** Arno van Wingerde (Fraunhofer)
Contributions from Hanne Wigum (Equinor), John Olav Tande (SINTEF), Aidan Cronin (Siemens) and Paul McKeever (ORE Catapult)

Boosting floating wind energy is a fascinating journey that relies on a short- to medium-term focus on technology development, cost reduction and industrialization, coupled with a long-term vision that is extremely promising. In the short term, this involves promoting this innovative technology by advancing its development, reducing costs and streamlining the industrialization process. This will ensure its competitiveness in the wider energy landscape. At the same time, it is now necessary to build a future in which floating wind energy takes centre stage as a source of electricity generation, facilitating the export of energy to meet global energy demand. In addition, this technology is essential for meeting the energy needs of island states and their quest for energy independence. It also offers the potential for integration with the oil and gas sector, creating synergies that enhance efficiency and reduce emissions. In addition, the long-term vision includes the exciting prospect of clean hydrogen production, an essential element of a sustainable energy future. Thanks to this dual approach, the full potential of floating wind energy can be unlocked, making it a competitive and transformative energy source for years to come

# Floating wind technology

**Session chair :** Antonio Ugarte (CENER)

Contributions from Ainhoa Cortes (CEIT) for WILLOW projet, Jan-Willem van Wingerden (TU Delft) for SUDOCO, Tuhfe Göçment (DTU) for TWAIN, Jincheng Zhang and Xiaowei Zhao for ICONIC

**TWAIN project,** spearheaded by a consortium of leading institutions including DTU, CENER, TUM, TUD, ENGIE, SoftServe, EDF, RAMBOLL, and F6S in 2023, represents a pioneering endeavor funded under the Integrated Wind Farm Control initiative within New Horizon Europe. This innovative project focuses on the development of Integrated, Value-based, and Multi-objective Wind Farm Control powered by Artificial Intelligence (AI). By combining AI-powered solutions and a multi-objective approach, TWAIN aspires to revolutionize the control and management of wind farms, fostering sustainable and efficient wind energy production while addressing complex environmental, economic, and societal considerations.

**SUDOCO project** (SUstainable resilient Data-enabled Offshore wind farm and COntrol co-design) is a collaboration between TU Delft, Danmarks Tekniske Universitet, Technische Universitet München, Politecnico di Milano, Shell, SOWENTO and YouWind Renewables. The consortium will solve a high-dimensional, real-time optimisation problem that takes into account not only price fluctuations, but also security of supply, extending the life of wind turbines, the depletion of scarce resources such as water and rare metals, the overall impact on greenhouse gas emissions, and local energy storage in hydrogen and batteries. The result of the project is an open-source software package – the wind farm control room of the future – that advises wind farm operators.

**WILLOW project** is led by a consortium of SMEs, Research Centers (CEIT, Flanders Marke, Sirrus, SINTEF) and Vrij Universiteit Brussel (VUB). Offshore wind farms face operational challenges due to fluctuating wind conditions, power grid demands, and harsh environmental factors, which negatively impact the structural health and useful lifetime of wind turbines. The WILLOW approach involves an integrated system that offers an open-source, data-driven smart curtailment solution for Wind Farm Operators, focusing on optimizing power dispatch. This solution aids in decision-making and maintenance scheduling, ultimately reducing the Levelized Cost of Energy (LCOE) and increasing Annual Energy Production (AEP), aligning with the industry's trend toward extending the lifetime of 20MW turbines to 50 years.

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**ICONIC project** will develop innovative digital and physical tools to achieve fundamental breakthroughs for the integrated control of wind farms, considering the whole physical system at farm, turbine, and component levels, in particular the complex aerodynamic interactions among turbines. It targets a significant performance gain by leveraging (1) the latest AI technologies on reinforcement learning and deep learning which offers unique advantages over conventional approaches in tackling system complexity, and (2) comprehensive considerations of controls at farm, turbine and component levels. The key results will contain novel AI-based wind farm control strategies, novel data-enhanced wind turbine controllers, an integration with digital twins (DTs) as extra support to improve control and reduce costs, and extensions of the solutions to future 20MW turbines. The proposed integrated control solutions will be demonstrated by an extensive validation study via high-fidelity simulation models, experiments at a national-level wind tunnel, historical wind farm operational data, and real-world wind farm field tests.

# Granted Horizon Europe Projects

**Wokshop chair :** Vibeke Nørstebø (SINTEF Ocean) & Jake Badger (DTU)
Contributions from Andre Craens (NWEA), Maarten Mouissie (Wageningen Marine Research), Tobias Grindsted (Danish Energy Agency)

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A massive scaling up of wind energy has significant implications for resources, the environment, and integration : We learnt that an effort to standardize wind turbine size as well having impacts on the industrialization (and reducing costs) of wind turbine and could also accelerate our understanding of the environmental impacts, i.e. bird clearance with tip not going below 25 m (above sea level) and not going above 305 m. Minimum capacity per foundation suggested as 14 MW. Standardization can help with supply of equipment and facilities for installation too. : When scaling up , standardisation also supports predictability. Wind farms require substantial offshore or land area to accommodate a large number of turbines. This can have implications on conservation efforts. Wind farms can have an large impact on local wildlife and ecosystems, both negative and positive. Careful planning is necessary to understand these effects and protect biodiversity. The advantage of standardization are crucial for developers, manufacturers of blades and other industries like logistics and can have, above all, a positive impacts on costs and ecology. It also strengthens predictability, innovation and enhances nature through restoration (measures, impacts, permitting, image recognition). A better understanding of the cumulative impacts is needed, which again is important for the spatial planning challenges. With massive upscaling , challenges related to the spatial planning will increase. And cumulative impacts of scaling up windfarms, in combination with all other industries using the ocean creates cumulative impacts that we have little knowledge about per today. Careful planning, technological advancements, and supportive policies are essential to harness the full potential of wind energy.

# Massive scaling-up and consequences

**Wokshop chair :** Arno van Wingerde (Fraunhofer)
Contributions from Peter Jamienson (University of Stharthclyde) and Peter Dalhoff (University of Hamburg)

Multi-rotor systems in wind energy present a unique and promising solution with significant environmental and industrial benefits. However, they come with several distinct challenges. Operation and maintenance (O&M) is a crucial aspect, particularly for systems with numerous rotors, and the associated costs remain uncertain, necessitating further detailed modeling. Addressing structural concerns, yawing mechanisms, and aerodynamics presents a set of formidable challenges, although there are no apparent show-stoppers in terms of feasibility or cost. Furthermore, ensuring reliability is a top priority, with the industry actively engaged in mitigating major fault centers like pitch systems and power converters, ultimately reducing O&M requirements and enhancing the competitiveness of multi-rotor systems when compared to conventional solutions. In parallel, the integration of artificial intelligence and robotics is making steady progress, offering significant advancements in the areas of O&M and multi-rotor system optimization, further solidifying their potential as a game-changing innovation in the wind energy sector.

# Multirotors and New Floating Wind Concept

**Session chair :** Paul McKeever (ORE Catapult)


**NeWindEERA** is a project funded by EERA JP Wind and will outline our new strategic research programme for the European wind energy research community. The programme will consider the present state of the art and subsequent research requirements to reach the 2050 energy goals facing our sector. On behalf of the EERA JPWind membership, the project will be delivered by **ORE Catapult, SINTEF, DTU, Ciemat** and **RWTH Aachen**.

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Work Package 3 tackles the challenge **of linking the research gaps identified in WP2 with the key research theme descriptions**. The descriptions will highlight the research topics and scope needed to fill the research gaps and the timelines and key milestones associated with the proposed activity. As with the WP2 chapter, the WP3 chapter will continue to align with the five R&I challenges of the new ETIPWind SRIA development and also tackle several non-technical cross-cutting themes that have arisen during the online workshops (legal/regulatory, economic, social, etc...) WP3 will also reflect on the existing EERA JPWind research programme to ensure that current key activity is not inadvertently overlooked in the new research programme.

# NeWindEERA Workshop Work Package 3

**Workshop chair on Aerodynamics :**
Koen Boorsma (TNO)

The field of wind energy faces a myriad of challenges in the realm of **aerodynamics**, which are of critical importance when designing efficient and reliable wind turbines. From an industry perspective, one key challenge revolves around the need for precise aerodynamic modeling and validation. This demands detailed measurements in both field conditions and wind tunnels to ensure the accuracy of computational simulations. Additionally, the phenomenon of vortex-induced vibrations poses a complex challenge that requires thorough understanding and mitigation strategies. To enhance predictive capabilities, there is a concerted effort to improve deep stall predictions through advancements in aerodynamic modeling. Furthermore, the aim of **IEA Task 47** is to cooperate in the field of detailed aerodynamic measurements on MW scale wind turbines

**Workshop chair on Structures, Materials, Components (SubProgamme 7) :** Arno van Wingerde (Fraunhofer)

Wind turbines have grown to be amongst the largest and highest loaded structures. Coupled with a need for lower energy costs, this means that t**he requirements an materials and structures are extremely high**. This Sub Programme aims to bring together the leading European research organizations in order to support the industry fulfilling these requirements. This implies a full understanding of structural response and increased knowledge of material behaviour in order to develop the appropriate tools and lay the basis for standards for designing such large structures, undertaking very high fluctuating loads, with increased reliability and reduced maintenance needs, while complying with all constraints of the wind turbine system. Materials, including better knowledge of properties, new and improved materials and their degradation and failure mechanisms provide **new opportunities** for weight and cost reductions, higher reliability and improved manufacture of blades, structures and mechanical components.

# Thematic and SubProgramme Workshops

# Special Award to Peter Hauge Madsen

*“I have been driven by the idea that wind energy can solve some of the world’s most pressing issues.Today we have come so far that wind has become the main source of electricity in many parts of the world. That’s more than we could have ever imagined 40 years ago.”*

Peter Hauge Madsen, former Head of the Department of Wind and Energy Systems at the Danish Technical University (DTU), JP Wind Coordinator until 2018 and Chair of the JP WInd Steering Committee took his retirement this year. We want to praise his leadership, his commitmment and his dedication in advancing the European wind energy research community.

During his career, Peter Hauge Madsen helped to shape and enlarge the Wind and Energy Systems department at DTU. His vision was to build a research society in Europe, bringing the brightest European scientists and researchers together, in being one of the architect of EERA JP Wind.

Thank you !

IP Wind: the largest European wind energy R&D network

# Thanks to all the organisations who took part !

# And to all the speakers !

Ignacio Marti (DTU)
Rosalinde van der Vlies (EU Commisson)
Jacob Edmonds (Ørsted)
Vibeke Nørstebø (SINTEF)
Lena Kitzing (DTU)
Pål Coldevin (RWE)
Alan Croes (Tennet)
Peter Eecen (TNO)
Adrian Timbus (Hitachi)
Nenad Keseric (Statnett)
Dirk van Hertem (KU Leuven)
Ignacio Cruz (CIEMAT)

Arno van Wingerde (Fraunhofer)
Hanne Wigum (Equinor)
John Olav Tande (SINTEF)
Aidan Cronin (Siemens)
Paul McKeever (ORE Catapult)
Ainhoa Cortes (CEIT)
Jan-Willem van Wingerden (TU Delft)
Xiaowei Zhao (University of Warwick)
Jincheng Zhang (University of Warwick)
Tuhfe Göçmen (DTU)
Dennis Bosse (RWTH)
Jake Badger (DTU)

Antonio Ugarte (CENER)
Andre Craens (NWEA)
Maarten Mouissie (Wageningen Marine Research)
Tobias Grindsted (Danish Energy Agency)
Peter Dalhoff (University of Hamburg)
Peter Jamieson (University of Strathclyde)
Alejandro Gomez Gonzalez (Siemens Gamesa)
Gerard Schepers (TNO)
Georg Pirrung (DTU)
Carlos Rodriguez (Suzlon)
Koen Boorsma (TNO)
Galih Banga (DNV-GL)

# EERA JP Wind in a nutshell

A one-stop shop for public wind energy R&D

A platform for coordination of research facilities, data and human resources

We bring wind energy research at the top of the agenda and coordinate our work across Europe

We engage with key stakeholders like European Commission, national funding agencies and industry

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**45** members

**14** countries

**8** sub-programmes

The mission for EERA JP Wind is to provide strategic leadership for medium to long-term research and to support the European wind energy industry and societal stakeholders. The joint programme brings together the major public research organisations in Europe with substantial research and innovation efforts in wind energy.

**Ignacio Marti**
DTU
JP Coordinator

**Peter Eecen**
TNO
SP1 Coordinator
Planning and Outreach

**Paul McKeever**
ORE Catapult
SP2 Coordinator
Research Infrastructures, testings and standards

**Jake Badger**
DTU
SP3 Coordinator
Wind conditions and climatic effects

**Antonio Ugarte**
CENER
SP4 Coordinator
Aerodynamics, loads and control

**Tuhfe Göçmen**
DTU
SP5 Coordinator
System Integration

**John Olav Tande**
SINTEF
SP6 Coordinator
Offshore Balance of Plants

**Konstanze Kölle**
SINTEF
SP6 Supporting
Offshore Balance of Plants

**Arno van Wingerde**
Fraunhofer
SP7 Coordinator
Structures, materials and components

**Vibeke Nørstebø**
SINTEF
SP8 Coordinator
Structures, materials and components

# EERA JP Wind Management Board

# Contact Us

For questions or clarifications.

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