Study on establishing a dedicated European Fund for Wind Research & Competitiveness

Technical report

Trinomics

With the support of

DTU

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Study at-a-glance

This report provides an **independent assessment of a proposed European Fund for Wind Research & Competitiveness (the Wind Fund) under the upcoming European Competitiveness Fund (ECF),** structured according to the main chapters presented below.

Chapter 2: Assessment of the necessity for EU action

Current challenges faced by the wind sector

- **Intensifying global competition** for the European wind sector, including due to unfair practices
- EU funding and policy frameworks **lack focus and do not adapt quickly enough** to achieve industrialisation
- **Insufficient European and national public support** for wind innovation and competitiveness, particularly for **industrial scale-up**
- **EU R&I instruments too fragmented and slow** to respond to the urgency of the challenge

Why a European Wind Fund?

- **Europe needs EU-level industrial leadership and funding to face global challenges** Individual Member States cannot address challenges alone
- **The next Multiannual Financial Framework is a unique opportunity** to link EU funding with the industrial objectives required for Europe's industrial leadership and resilience
- **A Wind Fund would enable a more strategic use of EU funding,** prioritising what works for Europe and strengthening European industrial capabilities

Chapter 3: Assessment of Wind Fund Impacts

- A **dedicated Wind Fund could deliver substantial added value compared to a baseline scenario without structural change**. By concentrating resources and aligning support across the innovation chain, the Wind Fund would address the key investment, scale up and delivery failures identified
- By 2040 the **Wind Fund would contribute to scientific-technological, economic and societal impacts**, including the following:

+EUR 33 billion per year Gross value added	**+180 000** Jobs	**+EUR 12.6 billion per year** Export value	**89.4%** EU-sourced equipment & services	**70 bcm/y** Gas imports displaced, or 700 LNG shipments

EUR 1 : 7/y - Each euro of public funding returns EUR 7 every year

Chapter 4: Wind Fund Implementation

- A governance arrangement for the Wind Fund including a **governing board, executive management and technical committee** would allow for efficient and coherent implementation
- The **Wind Fund operation could better perform functions** such as linking strategic programming to funding instruments deployment, project selection and evaluation, coordination with other programmes, and monitoring/performance management
- A **phased implementation pathway** would allow to transition from the current set-up to the kick-off of the Wind Fund under the next Multiannual Financial Framework

1 Introduction

1.1 The study

Trinomics, with the support of DTU, was commissioned by WindEurope to provide an independent assessment of a proposed European Fund for Wind Research & Competitiveness (the Wind Fund) under the upcoming European Competitiveness Fund (ECF). This study supports the broader European wind sector in making an evidence-based case for dedicated EU-level action under the next Multiannual Financial Framework (MFF) 2028–2034.

The study provides two key outputs:

- Policy summary
- Detailed technical report (this report)

This technical report is split into three main chapters:

Chapter 2 - Assessing the necessity for action: In this chapter we present an assessment of whether there is a proven need for EU action to further support wind energy research, innovation and competitiveness. This is provided through four analytical elements:

- An assessment of the economic, social, environmental and technological **contributions of the EU wind sector** (section 2.1);
- An overview of the **legal and policy context** governing wind energy, research and innovation (R&I), and industrial competitiveness at EU level (section 2.2);
- A structured **problem definition**, identifying the underlying causes of current challenges and their observed and emerging effects (section 2.3); and
- An analysis of **why the EU should act**, including considerations of subsidiarity, proportionality and EU added value (section 2.4).

Chapter 3 - Assessing a Fund for wind: The Wind Fund is proposed as a dedicated, ring-fenced wind window under the ECF which provides scaled-up, strategically focused support over 2028–2034. In this chapter we set out what this proposed Wind Fund should look like and assess the impact it could have. Two key sections structure the chapter:

- A proposal for what the Wind Fund should look like, including its purpose, the activities it should fund, how much funding is needed, which instruments would be used and how it would fit coherently into the existing funding landscape (section 3.1);
- An assessment of what impact the Wind Fund would have, addressing the scientific-technological impacts, the economic impacts and the societal impacts (section 3.2).
- A summary of key indicators for the impact assessment (section 3.3)

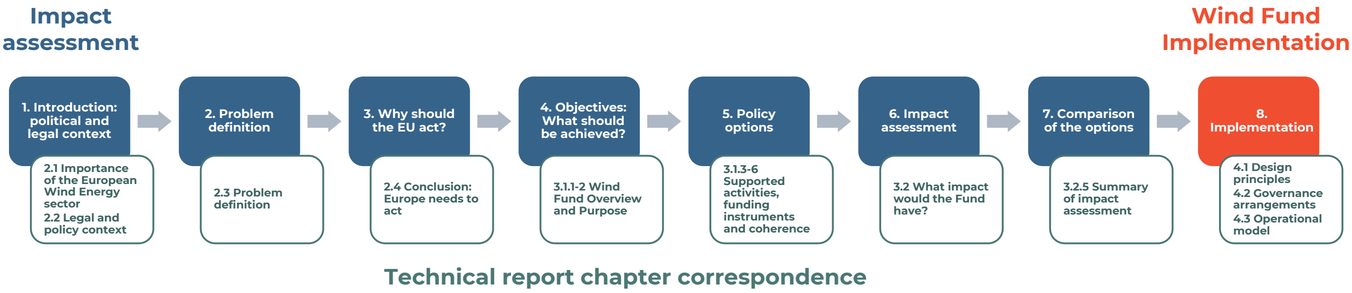
Chapter 4 - Implementation guide: In this chapter we make proposals for the practical implementation of the Wind Fund. This includes providing guidance on:

- Proposed governance arrangements for the Wind Fund, covering the bodies that could govern the fund, its operational basis and governance risks and mitigation measures (section 4.2);
- Operational models, covering strategic programming, funding instruments, project selection and evaluation, operational coordination with other programmes, approaches to intellectual property and data, and performance measurement and monitoring arrangements (section 4.3); and,
- A phased implementation pathway and transition approach (section 4.4).

1.2 Approach and methodology

The chapter structure and analytical techniques used for this work follow an approach consistent with the European Commission's Better Regulation Toolbox and previous assessments for European research and innovation (R&I) investments, especially assessments for Institutionalised European Partnerships. The Better Regulation Impact Assessment structure is reflected in the chapter structure, with the following correspondence to section headings.

Figure 1-1 Wind Fund impact assessment and implementation steps and correspondence to study chapters



Our approach combined qualitative and quantitative evidence with stakeholder input to ensure robustness and relevance to policy making. The evidence base for the work was built on three complementary activities:

- **Desk research**: a systematic review of EU and national policy documents, strategic roadmaps, evaluation studies and partnership assessments relevant to wind energy, R&I, industrial competitiveness and EU funding instruments. This included analysis of wind-specific strategies and broader policy frameworks shaping the clean energy transition and net-zero industrial development. The analysis draws on evidence from official and audited sources and published research, including from the Organisation for Economic Co-operation and Development (OECD), The European Commission's Joint Research Centre (JRC), International Energy Agency (IEA) and European Court of Auditors, and is complemented by industry and academic studies, as well as analysis on EU funding programme data and company level indicators.
- **Data and indicator analysis**: targeted analysis of available quantitative evidence to assess trends in wind-sector performance and policy effectiveness. This included data on R&I investment levels, funding distribution across instruments and lifecycle stages, deployment trends, competitiveness indicators and selected market and company-level evidence, where relevant to diagnosing problems and assessing impacts.
- **Stakeholder consultation and validation**: Nine semi-structured interviews with representatives from across the wind energy value chain, including original equipment manufacturers, component suppliers, project developers and operators, research organisations, and EU-level coordination bodies. The interviews were complemented by a validation workshop to test interim findings. Stakeholder input was used to triangulate desk-based evidence, assess the practical implications of identified challenges and to validate key assumptions underpinning the necessity test and impact assessment.

2 Assessment of the necessity for EU action

Key take-aways

- **The EU wind sector is strategically important for competitiveness, jobs, energy security and decarbonisation**. It supplied around 19% of EU electricity demand in 2024 (≈475 TWh) and supported over 338 000 jobs, generated nearly EUR 55 billion in EU Gross Domestic P**roduct (GDP)**, and avoided more than 90 billion cubic metres (bcm) **of fossil fuel imports, underlining wind's central role** in Europe's industrial base and energy security.
- **Current public support in the EU for wind research, innovation and industrial scale-up is inadequate.** Funding levels are too low relative to needs and global competitors (notably China), with the most acute gaps at demonstration and industrialisation stages, where capital intensity and risk are highest. Existing EU funding and policy instruments are fragmented, slow and complex, and poorly aligned with industrial decision timelines and wind-specific priorities.
- **Structural failures persist across the innovation-to-deployment chain.** The current EU support landscape does not sufficiently bridge the 'double valley of death' between research, demonstration and manufacturing scale-up, limiting the translation of Europe's strong wind innovation base into industrial capacity, competitiveness and deployment at the scale required by EU climate and energy targets.
- **Without further action, Europe faces significant risks.** These include loss of technological leadership, declining industrial competitiveness, higher import dependency, and adverse impacts on energy security and open strategic autonomy, as global competition intensifies and wind manufacturing and innovation increasingly relocate outside the EU.
- **The proposed Horizon Europe and ECF architecture creates opportunities but does not, on its own, resolve these structural weaknesses**. In the absence of prioritisation, critical mass and tailored delivery mechanisms, wind risks being diluted within broad, technology-neutral frameworks.
- **A dedicated, ring-fenced wind window under the ECF could address these challenges**. It could provide critical mass and multiannual funding visibility, faster and more interoperable delivery across the innovation chain, and clear strategic directionality aligned with EU policy frameworks, delivering clear EU added value consistent with subsidiarity and proportionality.

2.1 The importance of the European Wind Energy industry

Wind energy has evolved into a cornerstone of the European energy system and constitutes an important pillar of its industrial base, delivering substantial economic value, high-quality employment, and large-scale emissions reductions[1]. The European wind energy industry is recognised as one of the continent's most significant industrial, economic, and technological success stories of the energy transition.[2] Built over several decades through sustained public policy support, industrial capability and scientific excellence, the sector today represents a globally competitive European value chain spanning research, manufacturing, project development, grid integration, and post-commissioning services.

Wind energy plays a systemic role in providing secure, affordable and clean energy. In 2024, the EU recorded 231 GW of installed wind energy capacity (285 GW for Europe), of which around 91% was onshore wind and 9% offshore. Around 12.9 GW of new capacity was added in 2024 in the EU (and 16.4 GW in Europe). The respective electricity generated reached 475 TWh in the EU, contributing to around 19% of EU electricity demand, or equivalent to more than the combined electricity generation

[1] ETIPWind & Deloitte (2025) European Wind Energy Competitiveness Report
[2] European Commission (n.d.) EU wind energy

of Germany and Belgium.[3] At the same time, wind-based electricity generation contributed to avoiding over 90 bcm of fossil fuels imports to Europe, improving security of supply across Europe.

Wind energy also plays an important role in supporting European sovereignty and domestic industrial capacity, as it provides energy produced in Europe and is underpinned by a strong European manufacturing and services base. The European wind industry is also a major exporter, globally leading, with gross exports totalling EUR 13.8 billion in 2024. European wind turbine manufacturers had over 70% global market share in 2024, when excluding the Chinese market (to a large extent a closed market), demonstrating a leading global market position. Europe remains also a net exporter of wind turbine equipment, with a net export of EUR 2.3 billion recorded in this segment in 2024.

The wind industry makes a significant contribution to the European economy and industrial competitiveness. In 2024 the European wind industry[4] generated EUR 86.8 billion in revenues, while the activities related to the wind energy industry added almost EUR 55 billion to Europe's GDP. The direct contribution of the industry to the EU economy reached EUR 28.6 billion and the indirect contribution, through payments to suppliers, reached EUR 17.6 billion. In 2024 EUR 32.6 billion in wind energy investments were made of which 75% to onshore wind and 25% to offshore.

The European wind energy sector is a major employer, with further job growth expected in the coming years. The European wind energy sector supported in 2024 over 440 000 high-quality direct and indirect jobs across Europe and over 338 000 jobs in the EU specifically. These cover categories such as manufacturing, construction, operations, and advanced engineering, making it one of Europe's largest clean-tech employers. The employment is expected to grow to over 600 000 jobs by 2030, driven by the scale-up of onshore and offshore wind needed to meet EU climate and energy targets.[5][6]

The European wind industry invests significantly in technological development and innovation. The sector invests the equivalent of 4.1% of its direct GDP contribution in R&I activities, higher than the EU average of 2.2% and above the EU 2030 target of 3.0%.[8] European companies and research institutions have led global advances in turbine design, offshore foundations, grid integration, and digitalisation. However, while private R&I investment remains strong, public investment in wind R&I lags, particularly compared to the scale of support mobilised by competing economies.

Wind energy is a cornerstone of EU energy and climate policy, playing a crucial role in reducing greenhouse gas (GHG) emissions. It is estimated that wind energy generation led to annual avoided emissions of 142 $MtCO_2$ in 2024, equivalent to around 5% of total EU emissions, or around the same as the entire emissions of the Netherlands.

Looking ahead, the revised Renewable Energy Directive raised the EU's binding 2030 renewable energy target to at least 42.5%, with an aspirational target of 45%. The Commission assessment of the final updated NECPs estimates that national commitments would allow the EU to achieve a 41% renewable energy share in gross final energy consumption by 2030 – thus below the target of 42.5%. Achieving national projections (which in aggregate are higher than commitments) might lead to a final share of 42.6%, but this would still fall short of the aspirational target.[9] WindEurope estimates that reaching around 425 GW of installed wind capacity by 2030 would be sufficient to make the required contribution from wind towards achieving the 42.5% target. This would imply a very

[3] WindEurope (2025) 2024 Statistics and the outlook for 2025-2030
[4] EU27 and the UK
[5] Wind Europe (2025) Europe's Wind Energy Workforce Report
[6] ETIPWind (2025) European Wind Energy Competitiveness Report.
[8] Originally set in the 2002 Barcelona Summit and confirmed in the European Council conclusions of 17 and 18 April 2024
[9] European Commission (2025) EU-wide assessment of the final updated national energy and climate plans Delivering the Union's 2030 energy and climate objectives COM(2025) 274 final

substantial acceleration in deployment compared to current levels, with annual installations needing to increase significantly over the remainder of the decade.

This summary demonstrates the importance and contribution of the European wind sector to the EU economy, society and environment. However, the sector is facing a series of persistent challenges in recent years that could undermine its long-term competitiveness and industrial footprint.

2.2 EU legal and policy context

In this section we first detail the EU R&I policy relevant for the wind industry, before providing an overview of the key R&I funding frameworks, including Horizon Europe, the ECF and other instruments. This provides a clear background for the discussion of the key problems for the wind sector in section 2.3.

2.2.1 EU wind and Research and Innovation (R&I) policy

EU wind innovation and competitiveness policy is crucial for delivering the clean energy transition and preserving industrial leadership in a strategic net-zero sector. In practice, EU policy is substantiated as an ecosystem where wind is addressed through R&I programming and industrial/competitiveness frameworks that shape innovation, manufacturing, services, permitting and wind energy deployment.

The **Strategic Energy Technology Plan (SET Plan)[10] is the EU's long-standing framework for coordinating energy R&I priorities between the European Commission, Member States, industry and the research community**. Within the SET Plan, wind energy is addressed through a dedicated Implementation Working Group (IWG)[11] on wind, which brings together national authorities to align priorities and implementation actions, with a particular focus on offshore wind and emerging technologies.

The wind IWG provides the formal mechanism through which Member States coordinate on common R&I challenges, define priority actions and monitor progress. This coordination is operationalised through offshore wind implementation plans, including the initial plan adopted in 2018 and its revision in 2022, which identify priority technology areas such as next-generation turbines, floating wind, industrialisation and manufacturing processes, installation and operations, grid and system integration, and environmental and social aspects. These plans explicitly serve as a reference for aligning national and EU-level actions.[12]

Crucially, **the work of the SET Plan wind IWG is embedded in a broader wind R&I ecosystem that ensures alignment between industry needs, research capabilities and public implementation**. ETIPWind[13] plays a central role in articulating industry-driven priorities through its Strategic Research and Innovation Agenda (SRIA), which defines wind-specific R&I needs across the full innovation chain, including non-technological dimensions such as sustainability, skills and system integration. In parallel, the European Energy Research Alliance (EERA) Joint Programme on Wind[14] translates these priorities into coordinated research activities among leading European research organisations, structuring long-term research agendas and joint actions.

Alongside R&I coordination, **EU wind policy is increasingly shaped by industrial and competitiveness instruments** aimed at strengthening manufacturing capacity, supply-chain resilience and investment conditions for net-zero technologies. The **Net-Zero Industry Act** (NZIA) establishes a regulatory framework to scale up EU manufacturing of strategic net-zero technologies, explicitly including onshore and offshore wind and their key components. The Act sets a benchmark objective for EU manufacturing capacity to meet at least 40% of the EU's annual deployment needs by 2030 and introduces measures to support investment certainty, such as streamlined permitting

[10] European Commission (n.d.) Strategic Energy Technology Plan
[11] SETIPWind (n.d.) Implementation Working Group (IWG)
[12] European Commission (2022) SET Plan Offshore Wind Implementation Plan
[13] ETIPWind
[14] EERA (n.d.) What is EERA JP Wind

for strategic projects, the designation of net-zero strategic projects, and the use of non-price criteria in public procurement and renewable auctions. [15]

Complementing this regulatory framework, the **Wind Power Action Plan** adopted by the European Commission in 2023 sets out a package of near-term measures to address structural challenges faced by the European wind sector. These measures focus on faster and more predictable permitting, improved auction design (including the systematic use of qualitative award criteria), better access to finance, skills development, and trade-defence and international competitiveness tools. The Action Plan provides an important policy signal that frames how existing and future EU funding mechanisms should be mobilised in support of wind manufacturing, innovation and deployment.[16]

However, neither the Net-Zero Industry Act nor the Wind Power Action Plan includes dedicated funding provisions for the wind sector. As a result, while both instruments strengthen the policy and regulatory framework, they do not contribute to funding wind innovation, industrial scale-up and deployment.

2.2.2 EU R&I funding frameworks and programmes relevant to wind sector

In the proposal for the next Multiannual Financial Framework (MFF) period (2028-2034) Pillar 2: Competitiveness, Prosperity and Security is the most relevant for wind energy, innovation and industrial scale-up.[17] The proposed MFF introduces a restructured budget architecture organised around three main pillars, of which Pillar 2: Competitiveness, Prosperity and Security has two closely linked components: **Horizon Europe** and the newly proposed **ECF** (Figure 2-1). These two instruments together account for over EUR 400 billion of the proposed MFF allocation, signalling a prioritisation of research, innovation and competitiveness in the EU's future budgetary framework.

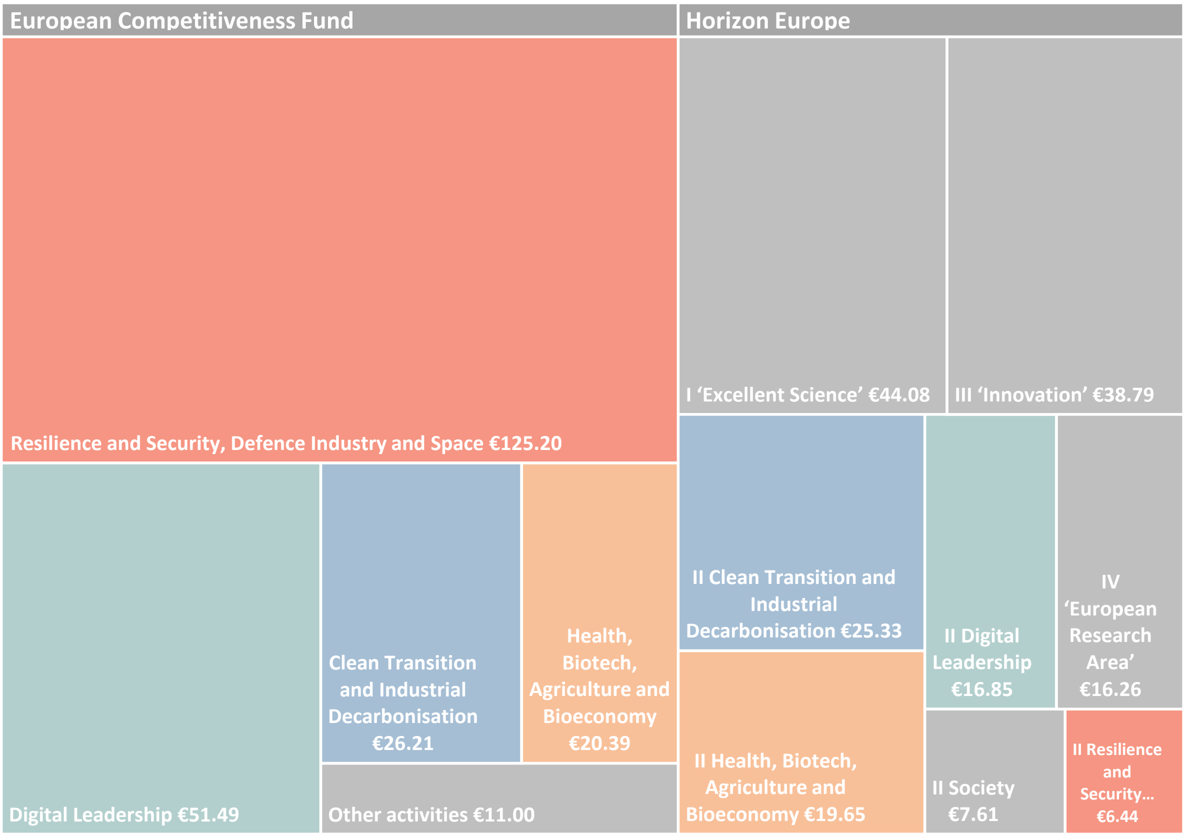
Horizon Europe and the ECF will remain distinct instruments with separate legal bases, but are designed in theory to work together, from the stage of research to market uptake. Horizon Europe mainly funds collaborative R&I, while the ECF is intended to help promising results move beyond R&I into demonstration, scale-up and deployment. To make this transition smoother, several Horizon Europe instruments are explicitly linked to ECF 'policy windows', so that projects supported under Horizon Europe can later access ECF support as they mature, on the following areas:

1. Clean Transition and Industrial Decarbonisation
2. Health, Biotech, Agriculture and Bioeconomy
3. Digital Leadership
4. Resilience and Security, Defence Industry and Space

The proposed Horizon Europe structure also foresees European Partnerships, Missions and the European Innovation Council, where early-stage innovation and scale-up financing should be connected with ECF and InvestEU instruments. In addition, ECF tools can be used to strengthen the valorisation of research results and to apply security and EU-preference measures where technologies are considered strategically important.[18]

[15] European Commission (2023) Net Zero Industry Act
[16] European Commission (2023) European Wind Power Action Plan
[17] European Commission (n.d.) The 2028-2034 EU budget for a stronger Europe
[18] Council of the European Union (2025) Horizon Europe Package: Framework Programme for Research and Innovation 2028-2034

Figure 2-1 Horizon Europe and ECF proposed budget allocation 2028-2034 (billion EUR)



Source: Own elaboration

Horizon Europe

Horizon Europe is expected to remain the EU's dedicated Framework Programme for R&I, with a proposed budget of around EUR 175 billion, organised around 4 pillars:

- **Pillar I 'Excellent Science'** strengthening the EU's scientific base, attracting talent and promote excellent research in Europe.
- **Pillar II 'Competitiveness and Society'** supporting collaborative R&I in areas of high societal impact, including the green/digital transitions, health, and security.
- **Pillar III 'Innovation'**, promoting the development of new products, services and business models.
- **Pillar IV 'European Research Area'** supporting the development of the European Research Area (ERA), including its widening and development of research infrastructures.[19]

Horizon Europe should **support wind-relevant activities** across a broad range of technology readiness levels, particularly through the proposed **Chapter IV 'Clean Transition and Industrial Decarbonisation'** under the 'Competitiveness' component of Pillar II (linked to an ECF policy windows as mentioned), but also through other chapters.

The **European Research Council** (ERC) is proposed to continue under the next Framework Programme, targeting early stage of research that can lead to long-term breakthroughs relevant to wind energy, for example in materials science, aerodynamics or power systems. Likewise, the **European Innovation Council** (EIC), and in particular the **EIC Accelerator**, are proposed to continue, with the accelerator targeting later stages of innovation by combining grants and equity-type

[19] European Commission (2025) Horizon Europe 2028 - 2034: twice bigger, simpler, faster and more impactful

support for high-risk scale-ups, typically supporting late technology development, first pilots and early commercialisation by innovative SMEs.[23]

The European Competitiveness Fund (ECF)

The ECF is designed to support industrial scale-up, deployment and value-chain resilience in strategic sectors, including clean technologies and net-zero industries. In particular, the proposed ECF Regulation includes in its scope, among multiple activities, support for the development, manufacturing and deployment of net-zero technologies, which includes wind turbines, key components, and associated manufacturing processes across the supply chain. Wind is also implicitly covered under activities that relate specifically to offshore energy within the sustainable blue economy, hence including offshore wind technologies and their enabling infrastructure. This is particularly important in the context of the **Net-Zero Industry Act**, which identifies wind energy as a strategic net-zero technology and sets manufacturing scale-up objectives, but does not itself provide a dedicated funding instrument. In this respect, the ECF is intended to help fill the investment gap left by the NZIA by providing financial support for the industrial scale-up, resilience and competitiveness measures needed to make those objectives operational.

Several elements in the ECF proposal are particularly relevant to wind:

- **Work Programmes**: Define annual/biannual ECF priorities, calls and budgets. Intended to ensure strategic targeting, retaining a strong Commission-driven design.
- **Single Market value chains:** The proposal allows for dedicated value-chains scale-up calls intended to support project preparation and to crowd-in additional public and private capital, explicitly aiming to integrate suppliers, manufacturers and innovators across Member States and diversify supply sources. [26]
- **EU Tech Frontrunners:** Introduces a two-stage, bottom-up approach to identify and support "EU Tech frontrunners", with support that can cover project preparation and the crowding-in of additional capital. This approach could be relevant for wind technology and industrial leaders (including supply-chain champions) if wind is prioritised in work programmes.[27]
- **Production Ramp-Up Actions:** Focuses on value-chain reinforcement and rapid industrial scale-up for strategic net-zero technologies by allowing financial contributions to start before their proposal is submitted for manufacturing projects which contribute to the ECF resilience objective.
- **Accelerated and Targeted Actions for Competitiveness:** Enables rapid intervention when supply-chain disruptions, market shocks or urgent industrial bottlenecks appear.
- **Top-Ups for Important Projects of Common European Interest (IPCEIs):** Allows ECF money to complement IPCEIs, enabling cross-border, large-scale industrial investments.
- **Grant-as-a-service:** such arrangements can serve as a mechanism allowing Member States to channel national funding through EU-level calls and procedures, while remaining compatible with state-aid rules. If applied to wind-relevant calls, such arrangements could help bridge gaps between EU-level project selection and national top-up or follow-on funding, particularly at technology development and demonstration stages.[28]

Other relevant instruments

The **Innovation Fund,** financed by EU Emissions Trading System (ETS) revenues, supports large-scale demonstration and early commercial deployment of innovative low-carbon technologies, including

[23] European Commission (2025) Europe's budget - Horizon Europe (2028-2034)
[26] European Commission (2025) Proposal on establishing the European Competitiveness Fund ('ECF)'
[27] European Commission (2025) Proposal on establishing the European Competitiveness Fund ('ECF)'
[28] European Commission (2025) RESourceEU Action Plan Accelerating our critical raw materials strategy to adapt to a new reality

renewable energy. It is particularly relevant for wind projects at the demonstration and early scale-up stage, where investment risks remain too high for conventional finance. While current calls are financed under the 2021–2030 ETS framework, the continuation of ETS-based innovation support beyond 2030 is expected but subject to future legislative decisions.

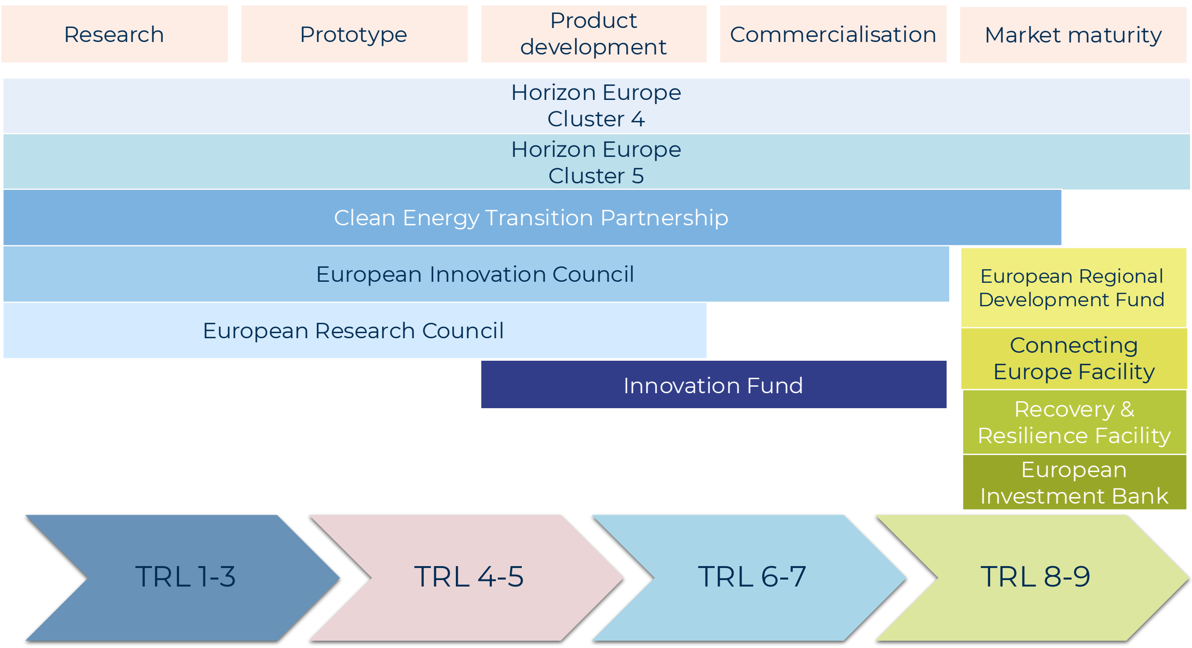
The **Connecting Europe Facility (CEF)** plays a central role in supporting energy infrastructure and renewables of European relevance. CEF Energy finances cross-border energy infrastructure under the Trans-European Network for Energy (TEN-E) framework, including electricity interconnectors and other transmission infrastructure (including offshore) critical for large-scale wind integration. It also supports studies, permitting and works for cross-border renewable energy projects where EU added value is demonstrated, including wind. CEF Transport can be indirectly relevant where transport infrastructure investments support offshore wind logistics and port infrastructure.[29] The MFF proposal for 2028-2034 aims to significantly scale up the CEF to nearly EUR 80 billion, which will fund cross-border RES projects and infrastructure in transport, energy and digital networks.

In addition, **State aid frameworks**, notably the Temporary Crisis and Transition Framework (TCTF)[34] and its successor the Clean Industrial Deal State Aid Framework[35], adopted in June 2025 , have enabled Member States to support clean energy and clean-tech manufacturing more rapidly. However, due to their temporary nature, they are not expected to constitute a core pillar of EU-level wind funding beyond 2027.

Summary

Taken together, the proposed EU R&I funding frameworks appear broad and adequate in scope, but they are not sufficient to support wind energy effectively across the full innovation and industrial scale-up chain. Furthermore, the proposed framework and budget allocation are still undergoing negotiations between the co-legislators, and thus are subject to change. The instruments summarised in the previous sub-sections are presented in Figure 2-2 below, with their scope overlaid with the steps in the innovation cycle.

Figure 2-2 Existing EU funding instruments across the innovation chain



Source: Trinomics

[29] European Climate, Infrastructure and Environment Executive Agency (n.d.) CET Transport
[34] European Commission (n.d.) Temporary Crisis and Transition Framework
[35] European Commission (n.d.) Clean Industrial Deal State Aid Framework (CISAF)

Problem definition: what are the key current and future challenges?

This section presents our analysis of the problems identified for the European wind sector. The **core challenge** has been identified as: **a fragmented, underfunded and misaligned wind innovation and industrial scale-up landscape in Europe, which is endangering competitiveness, energy security and resilience, and Europe's leadership in wind energy.**

In line with the European Commission's Better Regulation Toolbox approach to problem analysis, the section clarifies the scale of the problem, identifies **three main challenges** in the sector, details a number of drivers or causes, and assesses the likelihood that the problem will persist in the absence of further action. Figure 2-3 presents the problem tree resulting from the analysis.

The top tier of the figure sets out the three main problems which have been identified:

(1) lower wind energy R&I spend than competitors;

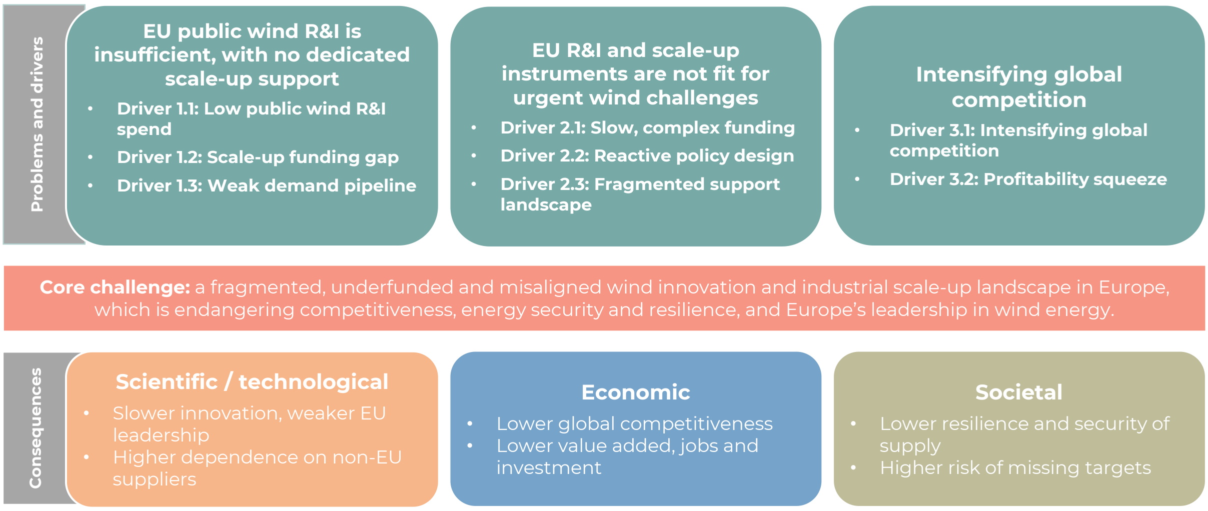
(2) EU R&I and scale-up instruments not being suited to the urgency of the challenge;

(3) Intensifying global competition

These problems and underlying drivers lead to the **core challenge** noted above.

The **consequences** of these challenges are identified and further specified in the lower level of the figure. Essentially the consequences are that if the identified challenges are left unaddressed, the EU will start to lose scientific and technological leadership, becoming increasingly dependent on other countries for wind technologies. This will have negative consequences for the EU industry, as it loses competitiveness, which will lead to a loss of economic growth and jobs, and finally there will also be implications for the EU energy security, energy independence, electricity supply and increased risks for meeting energy and climate policy targets.

Figure 2-3 Problem tree



2.3.1 Problem 1: EU public wind R&I is insufficient, with no dedicated industrial scale-up support

Total EU wind R&I spending remains lower than that of key global competitors, with no dedicated support for industrial scale-up and is insufficiently aligned with the needs of the sector. This reflects both comparatively low levels of public investment and limited capacity to mobilise private finance, particularly for demonstration and industrial scale-up. As a result, the EU faces persistent gaps across the innovation chain, from early-stage research to commercial deployment, which constrain the development, scaling and global competitiveness of innovative wind technologies.

The evidence presented below points to three main drivers of this problem.

What we observe (based on the evidence below):

- Driver 1.1: Total EU **public wind R&I spending is too low** relative to the sector's strategic importance, estimated needs, and competitor support levels.
- Driver 1.2: Public support is insufficient at demonstration and **industrial scale-up stages**, where innovative wind technologies face the "**double valley of death**" and private finance is hardest to mobilise.
- Driver 1.3: Current public funding and policy conditions do not create a sufficiently large and predictable **demand pipeline** to crowd-in private investment for innovative wind manufacturing and scale-up.

Taken together, these findings show that Europe's current level of public investment in wind R&I and lack of dedicated industrial scale-up support is not sufficient to meet the sector's technological and industrial needs, nor to keep pace with global competitors. Combined EU and Member State public investment is estimated at around EUR 500 million per year over 2025–2034, while ETIPWind indicates that at least EUR 600 million per year is needed already in the short term to meet identified sectoral R&I needs. At the same time, weak de-risking at demonstration and scale-up stages, combined with limited demand visibility, constrains the mobilisation of private capital and weakens the pipeline of bankable projects. The following sub-sections examine these three drivers in turn.

Driver 1.1: EU Public wind R&I spending is low

In this section we set out how total EU public funding for Wind R&I is low, including relative to other technologies and compared to competitors. As a starting point we provide an estimate of the level of EU and Member State public funding, both historically and projected forward (2025-2034) based on what is known from announced spending plans.

The analysis focuses on funds that provide direct, EU-managed financial support relevant to the wind innovation chain. This includes the Innovation Fund, Horizon Europe, CEF, European Regional Development Fund (ERDF) and European Maritime, Fisheries and Aquaculture Fund (EMFAF). These instruments were included based on their historical support to wind-related activities (R&I, demonstration, infrastructure and regional deployment). For each instrument, the historical share allocated to wind (based on an analysis past calls and project portfolios) was used as a proxy. It is assumed that these shares remain broadly constant over 2028–2034 in the absence of policy changes or earmarking. Where programmes end or change scope, funding is assumed to decline or end.

Total EU-level wind-relevant funding over the period 2025–2034 amounts to approximately EUR 2 billion, corresponding to an annual average of around EUR 200 million per year (in 2025 constant prices). This is composed of the following main instruments:

- **Innovation Fund:** Around **EUR 90 million per year**, supporting demonstration and first-of-a-kind deployment projects at higher Technology Readiness Levels (TRLs) (e.g. industrial scale-up and large innovative wind projects). While the current programme formally ends in 2030, the baseline assumes a successor instrument continues support thereafter.

- **CEF:** Around **EUR 75 million per year**, primarily supporting projects that have reached commercialisation and market maturity, including enabling infrastructure.

- **Horizon Europe:** Around **EUR 11 million per year** over 2028–2034, mainly supporting research and development at lower TRL (e.g., floating wind technologies and digitalisation).

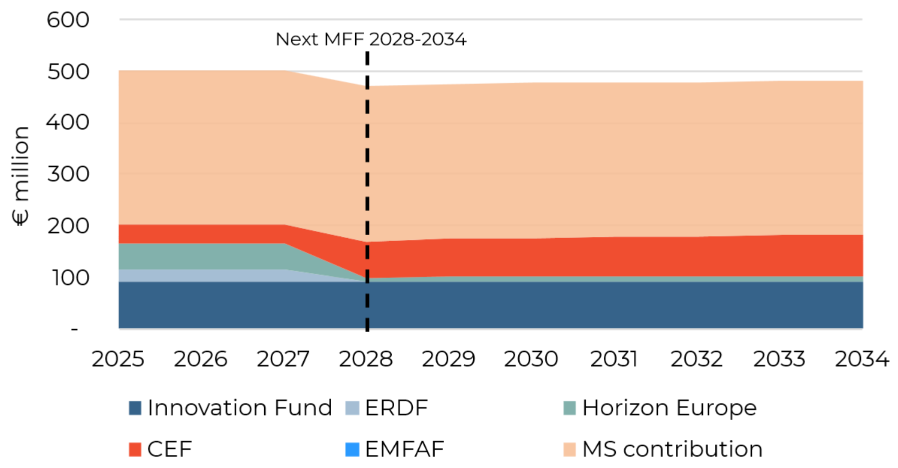
- **European Regional Development Fund (ERDF) and EMFAF:** Contributions are limited to the period **2025–2027**, with no confirmed allocations beyond this period. Their role is therefore expected to decline in the absence of new commitments.

In parallel Member States are estimated to fund wind energy R&I for around EUR 300 million per year (in 2025 constant prices)[36]. This is based on analysis of past contributions[37], the majority of which were concentrated in five Member States, namely Germany, France, the Netherlands, Denmark and Spain. It is assumed that the level of national contributions will remain broadly at the same level in future.

The combination of EU and Member State funding would bring the total public investment in wind R&I to around EUR 500 million per year (in 2025 constant prices) over the 2025-2034 period, as shown in Figure 2-4. The dip recorded in 2028 is related to the end of the ERDF and EMFAF programmes and to the expected smaller contribution of Horizon Europe for that year.

However, at least EUR 600 million per year is needed to meet wind R&I needs. ETIPWind's 'From Innovation to Industrial Competitiveness'[38] and 'Strategic Research and Innovation Agenda 2025-2027'[39] reports **call for a 20% increase in public wind R&I investment** to meet the short-term needs set out in the Strategic Research and Innovation Agenda (SRIA) 2025–2027. Applied to current levels, this implies a requirement of around EUR 600 million per year (or EUR 1.8 billion altogether for the 2025-2027 period) in public investment. In context, this increase of investment of EUR 100 million per year, would represent a small fraction of the more than EUR 100 billion publicly invested annually in R&I across the EU.

Figure 2-4 Estimates of EU funds for wind energy (2025-2034)



Note: the contribution of EMFAF is marginal (0.5 million per year for 2025-2027), therefore not visible in the graph.

The proposed ECF[40] may help address part of this gap, given its focus on **industrial scale-up** and strategic net-zero technologies, including wind. **However, the current proposal does not specify what level of future ECF support would be allocated to wind energy, and no dedicated wind envelope is foreseen.** In the absence of such earmarking, a funding gap remains in the baseline. This also highlights the relevance of the option assessed in Chapter 3, namely a dedicated Wind Fund under the ECF.

Industry has raised concerns about the volume of funding in the next MFF period. The solar and wind associations have welcomed the increased focus on competitiveness and the clean transition in the next MFF and ECF but remain concerned about the risks to predictability and scale. SolarPower

[36] ETIPWind (2025) From Innovation to Industrial Competitiveness
[37] For the period 2021-2023
[38] ETIPWind, EERA, WIND IWG (2025) From innovation to industrial competitiveness
[39] ETIPWind (2023) Strategic Research and Innovation Agenda 2025-2027
[40] European Commission (2025) Proposal for a Regulation of the European Parliament and of the Council on establishing the European Competitiveness Fund ('ECF') including the specific programme for defence research and innovation activities

Europe[41], underlined that while the proposal doubles total R&I funding and multiplies energy infrastructure support fivefold, the ECF remains too small and uncertain. They stress that EUR 67 billion is needed every year for distribution grids alone, whereas the fund allocates the same amount but over seven years and to dozens of competing priorities. WindEurope welcomes the stronger grid focus in the 2028–2034 MFF but warns funding falls far short of the EUR 584 billion needed by 2030. They stress that limited grid capacity is already delaying wind projects and harming competitiveness, arguing that the next MFF must align with the upcoming European Grids Package to ensure faster planning, permitting, financing tools, and flexibility solutions.[42]

The European Investment Bank (EIB) is also expected to remain an important source of support for the wind sector over the coming decade, although its contribution differs from the grant-based EU instruments covered above. The EIB supports wind primarily through loans, guarantees and blended finance for large-scale renewable generation, grid infrastructure and supply-chain investments. Based on a review of the EIB financed projects database for 2022–2024, the EIB contribution to wind-related projects is estimated at around EUR 486 million per year on average.[43] For example, in 2024 EIB provided a green loan of EUR 1.2 billion for the Thor offshore wind farm in Denmark.[44] This suggests that the EIB is likely to continue playing a significant role in financing higher-TRL deployment and industrial scale-up in the wind sector, although its contribution is best understood as complementary to EU budget programmes rather than directly comparable to them in annual funding terms.

EU public wind R&I spending is low relative to the sector importance and lacks dedicated industrial scale-up support

Europe's current level of public investment in wind R&I is not sufficient to meet the sector's technological and industrial needs, nor to keep pace with global competitors. Wind is expected to deliver a large share of the EU's energy transition, yet R&I investment has declined and remains well below what is required across the full innovation chain, from early research to demonstration and manufacturing scale-up. Additionally, there are clear economic benefits for supporting wind as each GW of onshore wind installed in Europe generated on average EUR 3.5 billion and on average every new onshore wind turbine added EUR 16.1 million to the European economy.[45]

Wind continues to receive less public R&I support than other key **energy technologies** as shown in Figure 2-5, despite its central role in the EU's decarbonisation pathway and electricity system. Across the full 2014–2024 period, **wind represented only 7.3% of funding** across the selected technologies shown in the figure. This is well below the average shares for **nuclear (20.6%), solar (12.5%), hydrogen (30.3%), and fossil fuels (19.5%)**. In most years, wind's share of funding remained below that of nuclear and solar, indicating that it has not been prioritised in line with its strategic importance to the EU's energy transition and industrial base.

This points to a persistent mismatch between the strategic importance of wind for the EU's decarbonisation and competitiveness objectives and the priority it receives in public Research Development and Demonstration (RD&D) funding, which is more concentrated on other technologies, particularly hydrogen and nuclear.

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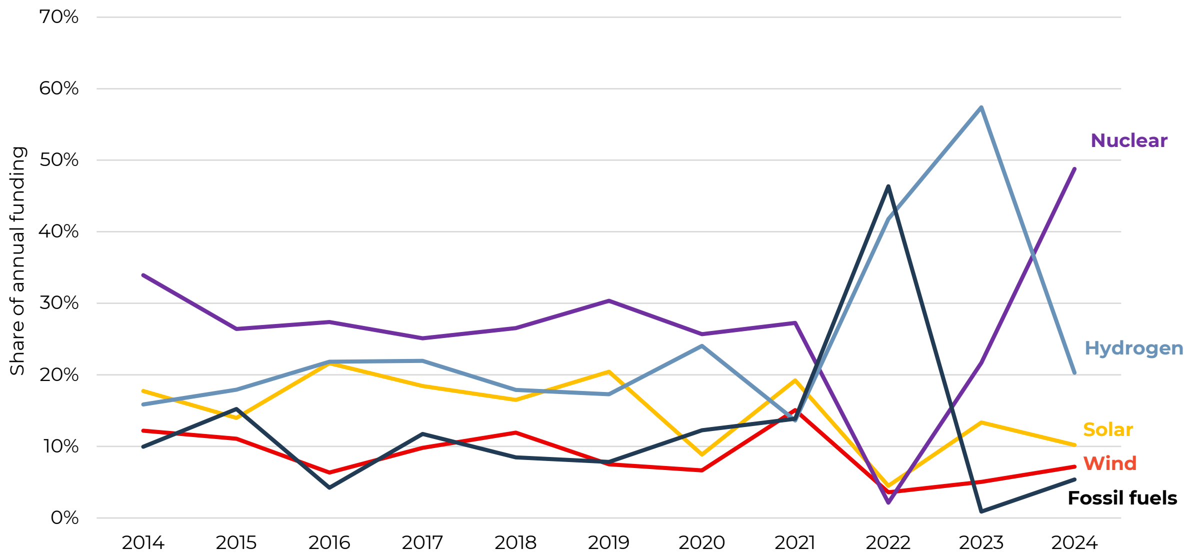
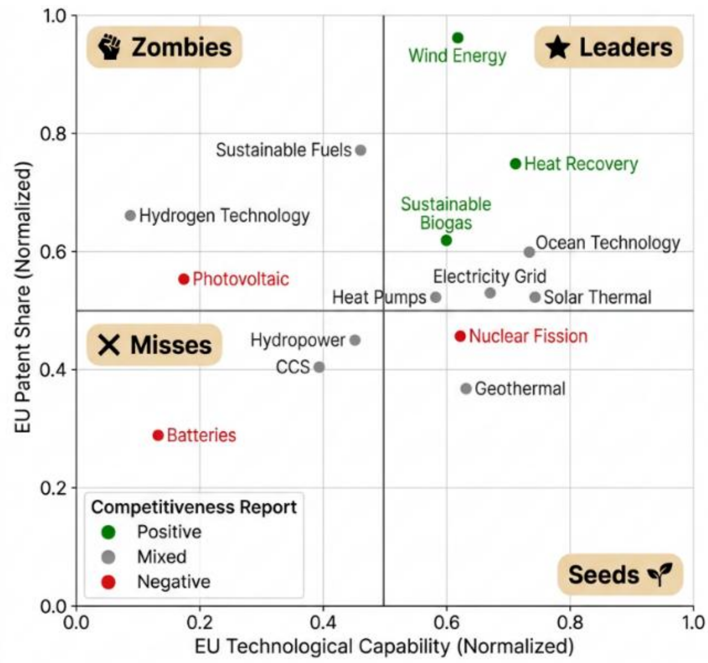
41 SolarPower Europe (2025) European Commission puts forward its proposal for the EU's next 7-year budget
42 Wind Europe (2025) EU Grid Action Plan will help renewables, but urgent action needed on excessive connection queues
43 Indicative estimate based on a review of wind-related projects in the European Investment Bank financed projects database for 2022–2024, using the average EIB-financed portion per project and the observed number of projects. See the EIB financed projects database: EIB financed projects
44 EIB (2024) Denmark/Germany: EIB to co-finance RWE's new Gigawatt offshore wind farm with a €1.2 billion green loan
45 ETIPWind (2025) European Wind Energy Competitiveness Report.

Figure 2-5 Share of European Commission RD&D funding across selected energy technologies, 2014–2024[46]



Recent JRC analysis of 15 net-zero technologies further supports the need for greater prioritisation. It finds that the EU has high potential manufacturing competitiveness in wind, classifying it as a 'Leader' technology, whereas photovoltaics falls into the 'Zombie' category and batteries into 'Misses'.

Figure 2-6 EU potential competitiveness in net-zero technologies in 2021, expressed as relative proximity to the country[47]



[46] Trinomics figure, based on extract from IEA (2025) Energy Technology RD&D budgets

[47] European Commission (2025) EU competitiveness in net-zero technologies: Insights from patents and economic complexity

EU public support to wind R&I and scale-up is lower than competitors

Key wind sector competitors, especially China, have much higher levels of support (3-9 times higher), covering R&I as well as scale-up. OECD company-level analysis[48] shows that Chinese wind turbine manufacturers receive substantially higher public support than those based in OECD economies. Since 2006, **Chinese producers** have typically benefited from around **3–5% of annual revenue in grants, tax concessions and below-market borrowing costs**, whereas support for **OECD-based manufacturers** has remained **under 1%** for most of the period, with an increase in 2023, driven primarily by new US Inflation Reduction Act production tax credits, rather than a structural shift in EU or OECD support levels.

Applied to the European wind industry, public support at levels comparable to those received by Chinese manufacturers would correspond to approximately EUR 1.7–4.3 billion per year, based on total EU27+UK wind industry revenues of EUR 86.8 billion in 2024. By comparison, current total (European Commission + MS) public R&I support for wind in the EU amounts to around EUR 0.4–0.5 billion per year, corresponding to less than 1 percent of sector revenues in recent years (2021–2024), **indicating that China's support levels are roughly three to nine times higher than those currently available in Europe**, highlighting a significant gap in the level playing field for wind innovation and industrial development.

In previous decades the same situation emerged for solar PV, and this saw the EU industry decline and Chinese manufacturers take over. The experience with solar PV is instructive: China overtook the EU in technological capability in 2004 and in manufacturing output by 2008.[49] This highlights the importance of directing funding towards technologies such as wind, where the EU has stronger prospects to translate innovation into industrial competitiveness. The Europe-based solar industry decline was partly due to European (and other OECD)-based manufacturers receiving far less public support than their Chinese competitors (see Figure 2-7 and Figure 2-8). Chinese solar module and cell manufacturers generally received around 3 to 6 per cent of annual revenue in public support, with below market borrowings and income tax concessions being the dominant instruments. These instruments were used to support manufacturing and supply chain innovation and scale-up, enabling the take-over of the production of this technology. It is notable that the OECD-based solar manufacturers, despite their decline, still received relatively higher public support than that received by OECD-based wind manufacturers.[50]

Figure 2-7 Total subsidies by type, % of wind company revenues, across all firms in sample[51]

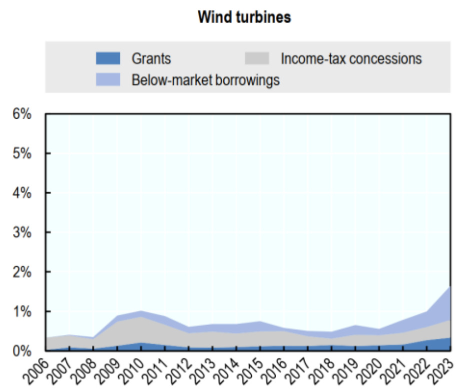
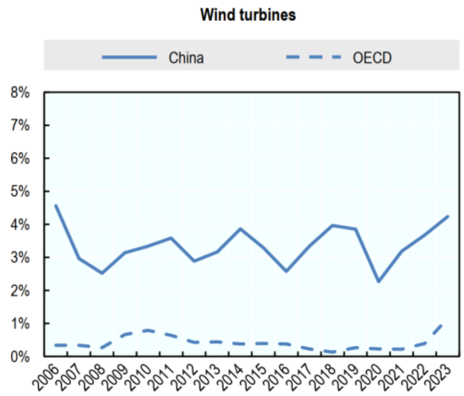


Figure 2-8 Total subsidies by jurisdiction or region, % of wind company revenue[52]



[48] OECD (2025) Trade policy paper, No. 288 - Government support in the solar and wind value chains
[49] European Commission (2025) EU competitiveness in net-zero technologies: Insights from patents and economic complexity
[50] OECD (2025) Trade policy paper, No. 288 - Government support in the solar and wind value chains
[51] OECD (2025) Trade policy paper, No. 288 - Government support in the solar and wind value chains
[52] OECD (2025) Trade policy paper, No. 288 - Government support in the solar and wind value chains

Figure 2-9 Total subsidies by type, % of solar company revenues, across all firms in sample [53]

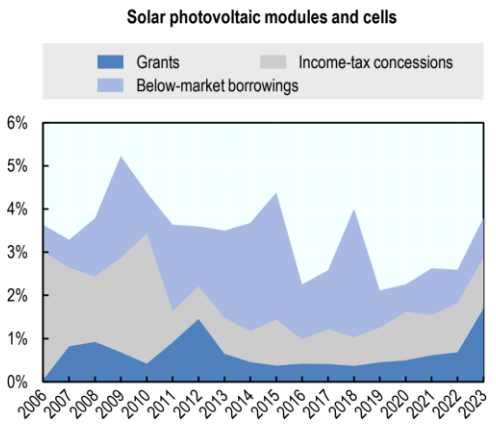
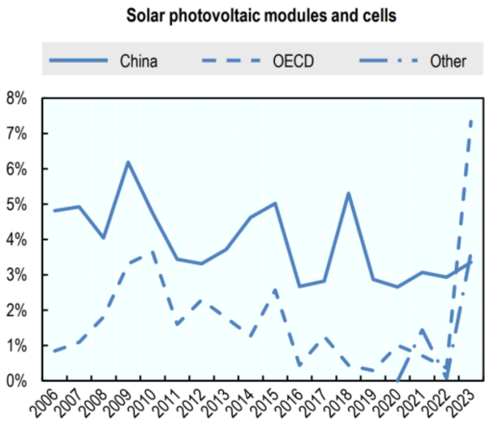


Figure 2-10 Total subsidies by jurisdiction or region, % of solar company revenue[54]



The subsidies concern goes deeper than higher volumes, it also encompasses competition distorting subsidies. This is reflected in recent EU action: in 2026, the European Commission opened an in-depth investigation under the Foreign Subsidies Regulation into Goldwind's (a leading Chinese wind energy manufacturer) activities in the EU wind sector, citing preliminary concerns that foreign subsidies may have distorted competition in the internal market for wind turbines and related services.[55]

Driver 1.2: EU wind R&I spending is insufficient to address the 'double valley of death' (demonstration and scale-up) for innovative wind technologies

Wind energy is particularly vulnerable to the double valleys of death. The concept of the "double valley of death" is illustrated in Figure 2-11 below, this shows how financing needs and investor risk perceptions evolve as technologies move from research to market deployment. Significant financing risks and gaps tend to emerge at two key stages of technological development, at pre-commercialisation (prototyping and demonstration) and at scaling (commercialisation and manufacturing scale-up). These gaps can be particularly pronounced for capital-intensive energy technologies such as wind where, for example, innovation extends beyond turbine design to include manufacturing and industrial processes, digital and operational solutions, and system-integration capabilities.

Pre-commercialisation requires public funding, however public funding typically decreases at this stage, creating a gap.[56] As technologies move from research into product development, they face significant increases in investment requirements, since solutions must be tested and technical performance and economic viability validated under real-world conditions. At this point (research and prototyping), the technological risk is highest, and the need for funding from public programmes and private actors that fund early-stage technologies (venture capital, angel investors) is also highest. Private actors such as these are less interested in sectors such as wind, putting the emphasis onto public funding to bridge the gap, as the technological risk remains too high for commercial lenders and capital markets.

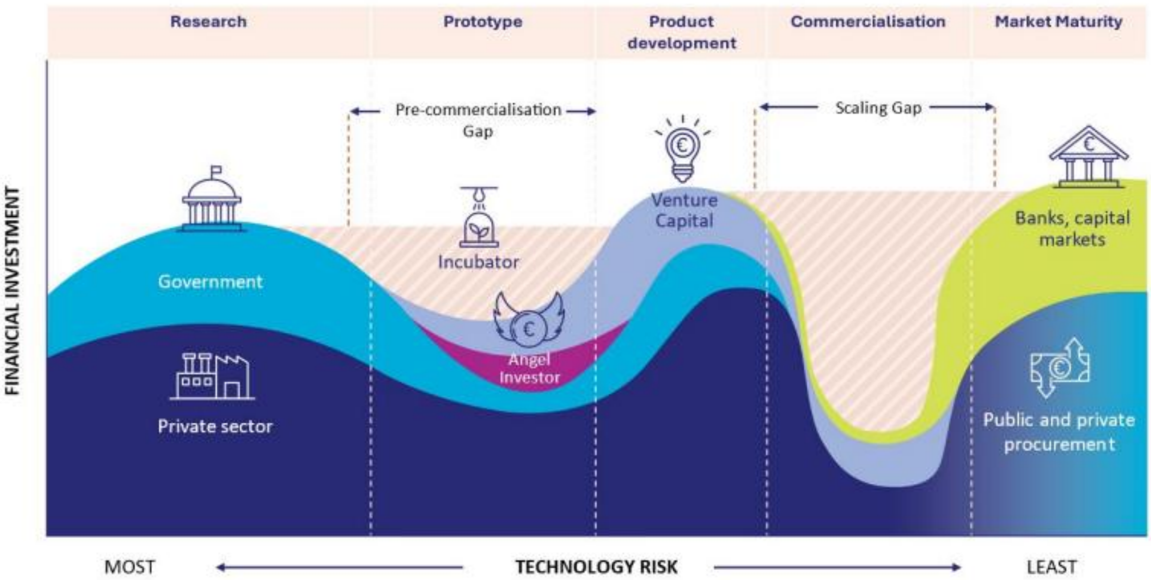
The large investments required to move from first-of-a-kind to industrial scale, lead to a second and often deeper scaling gap, where public (and private) funding is also insufficient. At this stage technologies have reached initial market entry but must move from **first-of-a-kind projects to industrial-scale roll-out**. This phase requires substantial growth of capital, supply-chain expansion, and credible long-term demand signals, such as predictable project pipelines, stable offtake

[53] OECD (2025) Trade policy paper, No. 288 - Government support in the solar and wind value chains
[54] OECD (2025) Trade policy paper, No. 288 - Government support in the solar and wind value chains
[55] European Commission (2026) Commission opens in-depth foreign subsidies investigation into Goldwind's activities in the EU wind sector
[56] IEA (2024) Advancing Clean Energy Demonstration Projects

arrangements, or revenue certainty. Despite lower technological risk, the scale of investment required and remaining market uncertainties can continue to deter private finance. [57] An important role for public finance and risk-sharing emerges, to help bridge this gap, but again public funding is typically insufficient.

Together, these issues create a reinforcing cycle: high early-stage risk reduces private investment, limited demonstration funding prevents technologies from **de-risking and insufficient scale-up finance** constrains the manufacturing base needed to deliver **bankable projects**. The two following sub-sections further elaborate on the reality of these gaps and the double-valley for the wind sector.

Figure 2-11 Illustration of the double valley of death (European Commission, 2025)



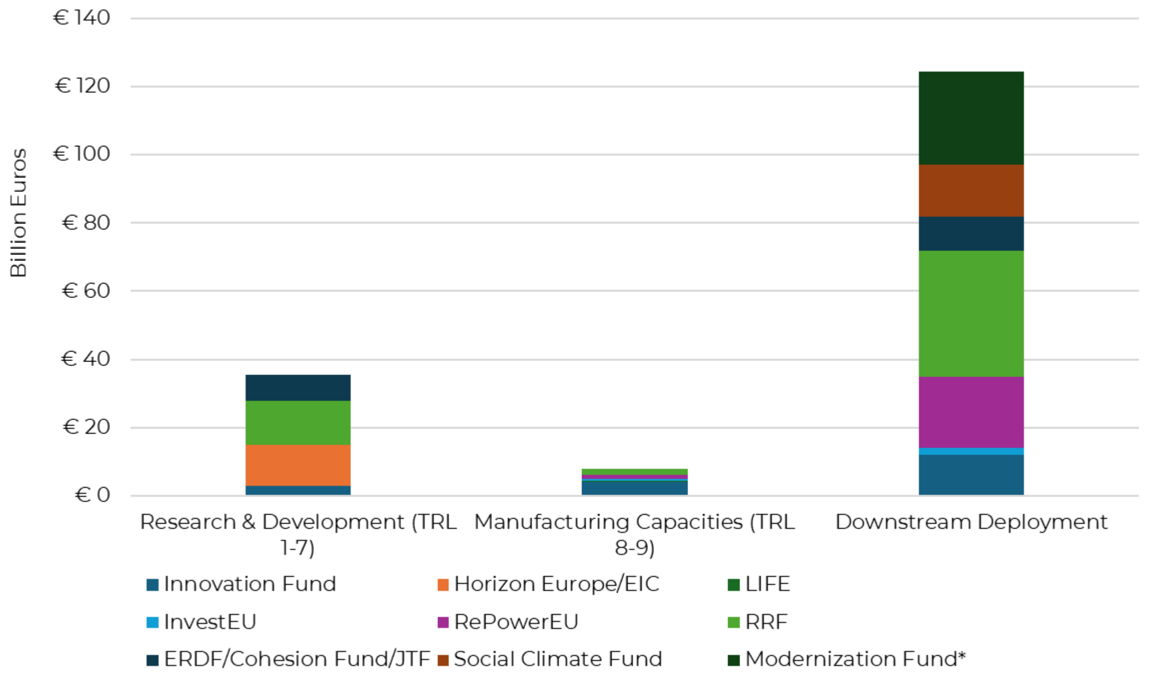
EU public funding of Wind R&I doesn't adequately support manufacturing scale up

EU funding across the innovation chain is unevenly distributed, with comparatively **limited support directed towards manufacturing scale-up (TRL 8–9)**, where financing needs are highest and private capital is most difficult to mobilise. As illustrated in Figure 2-12, **EU funding support across all net-zero technologies is weak on scaling up** and is concentrated in early-stage research and downstream deployment, while funding for intermediate stages, particularly manufacturing capacity and industrial scale-up remains relatively limited and fragmented across instruments.

Horizon Europe and the Innovation Fund mainly support R&I and demonstration (TRL 1–7), while the RRF and the Cohesion policy funds are more focused on downstream deployment. By contrast, fewer instruments provide dedicated and sufficiently scaled support for the transition from first-of-a-kind projects to industrial-scale manufacturing (TRL 8–9). Where support exists, it is spread across several instruments, including InvestEU, the Innovation Fund and Cohesion policy, with different rules, timelines and objectives.

[57] European Commission (2025) The EU Startup and Scaleup Strategy

Figure 2-12 Estimated potential support to different stages of net zero technologies in the EU between 2021 to 2027 (EUR billion)[58]



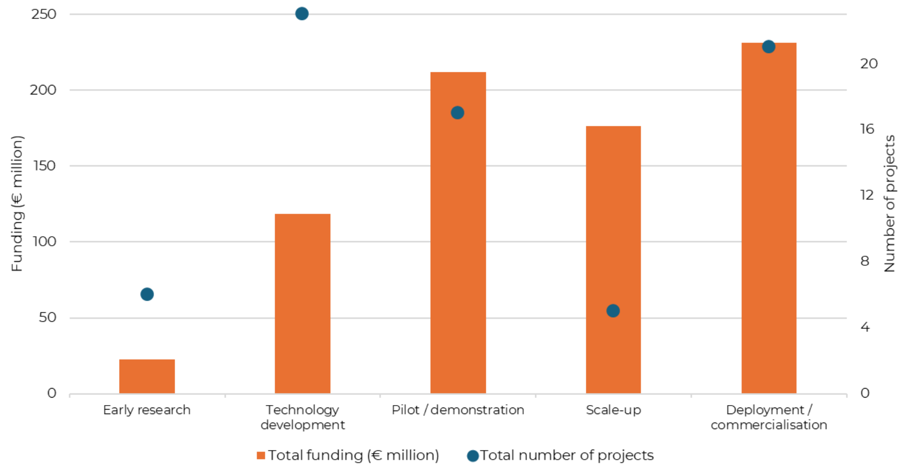
These structural issues are also noticeable for EU wind energy R&I support. Figure 2-13 shows EU contributions (2021-2024) from 11 programmes (Horizon Europe Clusters 4 and 5, the European Research Council (ERC), the European Innovation Council (EIC), the Clean Energy Transition Partnership (CETP), the Innovation Fund, CEF Energy, CEF Transport, the European Maritime, Fisheries and Aquaculture Fund (EMFAF), Erasmus+, and the European Regional Development Fund (ERDF), under Cohesion policy) distributed across project stages. In total, these instruments supported 72 wind-related projects with EUR 761 million in EU grants. The distribution illustrates a clear imbalance across the innovation chain. Pilot and demonstration projects received substantial support, and deployment and commercialisation projects received the largest funding volume at EUR 231 million, reflecting the high capital intensity of projects at this stage. By contrast, **industrial scale-up support remained more limited**, with only five scale-up projects funded over the period. This creates a gap between successful pilots and the manufacturing investments needed to bring innovative wind technologies to market at scale.

This pattern is consistent with recent research on the EU renewable energy industry, which identifies a persistent "valley of death" where technologies stall between R&I and early commercialisation because funding streams are not aligned across stages.[59] The same study finds that high demonstration and first-of-a-kind costs are rarely matched by adequate public or private finance, restricting investor participation and slowing market rollout. Limited access to risk-mitigation instruments further reduces the bankability of technologies at TRL 6–8, which in turn constrains industrial scale-up.

[58] European Commission (2025) Proposal on establishing European Competitiveness Fund (ECF) Impact Assessment

[59] Muscio, A., Simonelli, F.,& Vu, H (2023) Bridging the valley of death in the EU renewable energy sector: Toward a new energy policy

Figure 2-13 Distribution of EU wind funding by stage: funding and number of projects, 2021-2024 total[60]



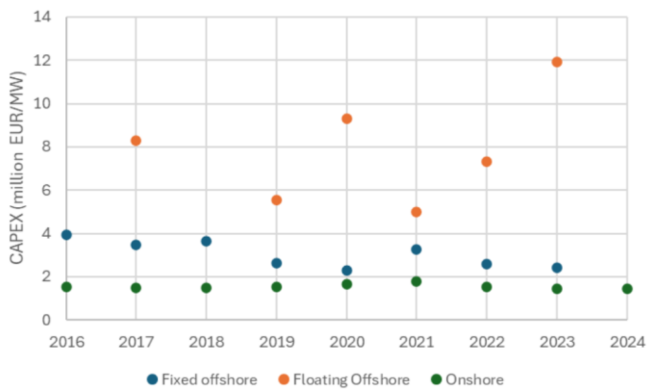
Driver 1.3: Public funding of wind and wind R&I is not supporting a large enough demand pipeline to fully incentivise private investment in scale-up

Private investment in wind R&I occurs at volume but investment in scale-up depends on predictable demand and de-risking; current policy/funding doesn't provide enough of either. Industry is investing in the sector, clearly demonstrating commitment. Over the past three years, the European wind supply chain has announced more than EUR 13 billion in investments in factories, ports, and vessels.

High and volatile capital expenditure requirements make investment in wind R&I riskier for private investors

Variations in capital expenditure (CAPEX) requirements for innovative wind technologies make it difficult for investors to assess their bankability and to commit capital at scale. The JRC wind energy status report[61] show that CAPEX requirements for fixed offshore wind have fluctuated markedly over the past decade, and floating wind exhibits even greater volatility due to its early stage of development and limited deployment experience (Figure 2-14).

Figure 2-14 Average CAPEX of fixed offshore, floating, and onshore wind projects in the EU[62]



[60] WindEurope funding database
[61] JRC (2025) Clean Energy Technology Observatory: Wind Energy in the European Union - 2025 Status Report on Technology Development, Trends, Value Chains and Markets
[62] JRC (2025) Clean Energy Technology Observatory: Wind Energy in the European Union - 2025 Status Report on Technology Development, Trends, Value Chains and Markets

In capital-intensive sectors such as wind, public R&I, demonstration and scale-up funding plays a critical role in de-risking new technologies and innovations, and creating bankable investment opportunities for private capital.

Beyond technology cost volatility, bankability is also affected by the recent shift towards negative-price tenders[63] and by the absence of a stable, well-sequenced demand pipeline across MS, which reduces visibility for manufacturers and constrains asset utilisation.

The highlighted risks are evident in low investment in wind by Venture Capital (VC) and Private Equity (PE) in the EU compared to China or the US. This is shown in Figure 2-15 and Figure 2-16, where the EU captured only 17% of global wind energy VC/PE investment since 2019, far behind China's 45%, and that VC and PE activity in the EU remains concentrated in just a few MS, and deal sizes outside major transactions remain modest. Additionally, within the EU, most beneficiary countries attract limited early-stage investment, and it is concentrated in only a handful of MS. This is important as although the EU hosts strong industrial actors who do invest in wind R&I, further finance such as VC and PE also needs to be mobilised to scale-up innovative technologies.

Figure 2-15 Global VC/PE EU investment in the wind energy sector, by region for all deals[64]

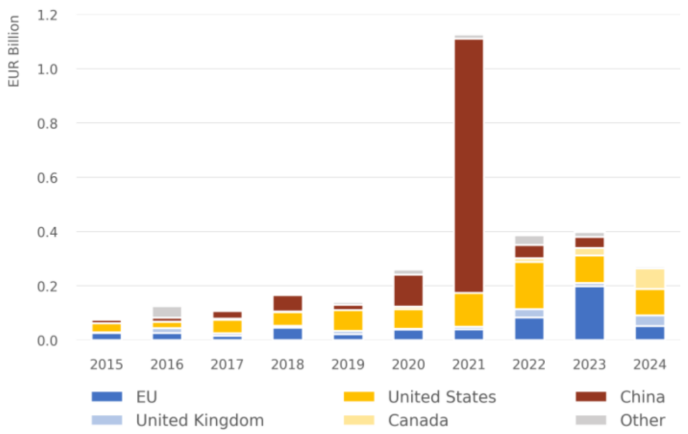
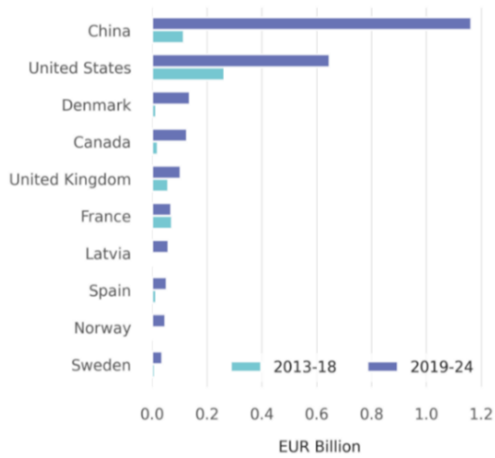


Figure 2-16 VC/PE investment in the top 10 beneficiary countries for all deals[65]



Public policy and funding shortfalls lead to uncertainties in the demand pipeline, deterring private investment in innovation and industrial scale-up

Investment in scale-up remains crucial, as even if capacity is sufficient in the short term, in the longer term, competing in global markets for innovative technologies and meeting EU energy and climate targets requires capacity expansion. For private investors, the decision to finance innovation and manufacturing scale-up depends not only on technical capability, but also on confidence that there will be sufficient future demand to justify the investment. Short-term utilisation of new manufacturing capacity and infrastructure is mixed, with some underutilisation and some specific bottlenecks emerging, for example onshore installations could exceed existing blade capacity by 2026 and nacelle capacity by 2027, and for offshore wind, the main risks lie less in turbine component manufacturing than in enabling infrastructure, notably ports and installation vessels.

In the medium-long term financing and market visibility rather than physical capacity alone are key drivers of private R&I investments[66]. Further investment depends on a stable and credible project pipeline, supported by clear auction schedules, timely permitting, and bankable projects.

[63] WindEurope (2025) Is negative bidding finally dead?
[64] JRC (2025) Clean Energy Technology Observatory: Wind Energy in the European Union - 2025 Status Report on Technology Development, Trends, Value Chains and Markets
[65] JRC (2025) Clean Energy Technology Observatory: Wind Energy in the European Union - 2025 Status Report on Technology Development, Trends, Value Chains and Markets
[66] WindEurope (2025) Supply Chain Workshop – Report – May 2025

At global level the market pipeline visibility is strong, as wind deployment continues to accelerate, **however the EU annual installation rate has remained broadly flat in recent years.** Data shows that the most growth in wind, and the fastest growth, is occurring outside Europe. This pattern is visible across total wind, onshore and offshore segments, and reflects a shift in growth towards emerging markets rather than a contraction of EU activity. This weakens Europe's attractiveness as a location for innovation-led investment, as firms may prioritise R&I and industrial scale-up in markets where deployment growth is faster and demand visibility is stronger.

Low deployment rates in the EU reduce the capacity of the industry to invest in innovation. One of the key challenges for the EU industry is that the current deployment rate of wind energy in Europe remains below that required to meet the EU 2030 and post-2030 climate and energy objectives and the targets in Member States National Energy and Climate Plans (NECPs).[67] Analysis shows that for most Member States with published targets, installed wind capacity would need to at least double or triple within the next six years, with even larger increases required to align with 2050 pathways. In the wind sector, large-scale deployment generates revenues, learning effects and operational experience that help finance and de-risk further R&I. When deployment lags, these feedback effects are reduced, constraining both private investment and the innovation pipeline. Slower deployment not only jeopardises progress towards EU climate and energy targets, but also weakens the link between deployment and innovation.

Evidence already shows weak demand visibility in Europe leading to manufacturing closure. Recent developments in the European manufacturing base illustrate these financing and demand-visibility constraints. Since 2010, 97 wind manufacturing sites have shut down in Europe. More recently, some manufacturers have delayed or cancelled planned investments because of weak or uncertain demand conditions in the European market.[68] For example, one leading original equipment manufacturer (OEM) shelved plans for a new offshore blade factory in Poland in response to weaker-than-expected market conditions.[69] These developments reinforce the point that the challenge is not only one of technical manufacturing capacity, but also of investment confidence, visibility of future demand, and the ability to mobilise finance for industrial expansion.

The market visibility and finance gap translates into an insufficient and uneven pipeline of investable projects. Without a more predictable pipeline of projects and supporting investment signals, additional capacity expansion may not materialise in time to meet future deployment needs. Public support (including for wind deployment), and funding frameworks need to improve to achieve this, to crowd in private investment at the required scale. In the absence of such signals, private investors are more likely to delay, reduce or relocate innovation-related investments, particularly where competing markets offer stronger demand certainty and more attractive de-risking frameworks.

Recent EU initiatives illustrate how public financial institutions can support industrial scale-up and investment de-risking. For example, the Industrial Decarbonisation Bank aims to mobilise up to EUR 100 billion for low-carbon industrial projects, while the EU Battery Booster package combines Innovation Fund grants and InvestEU guarantees with European Investment Bank financing to crowd in private investment for battery manufacturing. However, it remains to be seen how effective such new initiatives will be and how they might benefit the EU wind sector.

2.3.2 Problem 2: EU R&I and scale-up instruments are not focused nor suited to deal with the urgency of the challenge for wind

EU R&I instruments are not sufficiently focused or suited to the urgency of the challenges facing the wind sector. Current funding frameworks remain slow, complex, fragmented, and insufficiently adaptive to the pace of technological, industrial, and competitive change. As a result, European support often reaches projects too late, is difficult to combine across instruments, and does not

[67] JRC (2025) Clean Energy Technology Observatory: Wind Energy in the European Union - 2025 Status Report on Technology Development, Trends, Value Chains and Markets
[68] Wind Europe (2020) Wind energy and economic recovery in Europe
[69] CNBC (2025) Vestas shelves Polish wind turbine plant on low European demand

provide a coherent funding pathway from research to demonstration, industrial scale-up, and deployment. This is particularly problematic at TRL 7–9, where demonstration, first industrial deployment, and manufacturing scale-up require targeted de-risking and investment support.

The evidence presented below points to three main drivers of this problem.

What we observe (based on the evidence below):

- Driver 2.1: EU R&I instruments are complex, slow, and bureaucratic, with time-to-grant often misaligned with industrial decision timelines.
- Driver 2.2: EU funding and policy frameworks are often reactive, meaning that emerging competitive pressures and sector needs are not translated quickly enough into funding priorities.
- Driver 2.3: EU and national funding instruments remain fragmented and insufficiently focused, with no coherent pathway linking research, demonstration, industrial scale-up, and deployment.

Overall, the issue is not only the level of funding, but also how funding is delivered and targeted. Existing instruments, including Horizon Europe, the Innovation Fund, CEF, InvestEU, Cohesion policy, and national schemes, do not form a sufficiently sequenced or interoperable pipeline for wind innovation and industrialisation. In addition, policy initiatives such as the Net-Zero Industry Act (NZIA) and the proposed Industrial Accelerator Act (IAA) strengthen the regulatory and industrial policy framework but do not provide dedicated funding for net-zero technologies. **This leaves a critical gap for wind, particularly at TRL 7–9, where targeted finance is needed to move from demonstration to first industrial deployment and manufacturing scale-up**. The following sub-sections examine these drivers in turn.

Driver 2.1: EU R&I instruments are complex, slow and bureaucratic

The Draghi[70] and ECA reports[71] have stated that EU funding procedures are currently complex, slow and administratively burdensome, reducing their attractiveness for industry and research actors and weakening Europe's ability to accelerate wind energy innovation and deployment. Lengthy evaluation cycles, unclear call descriptions, extensive reporting obligations and heterogeneous rules across instruments increase transaction costs and delay investment decisions, as shown in the analysis below.

Lengthy and complex procedures to access funding

An assessment by the European Commission's independent expert groups of the Horizon Europe programme indicates a notable rise in procedural timelines for EU funding.[73] **Time-to-grant** under **Horizon Europe now averages 273 days**, 8% longer than under Horizon 2020, and "almost 60% of grants are not signed within the expected period of eight months." For the **Innovation Fund** the average **time-to-grant is "almost 11 months"**, delaying project starts in a sector where long lead times already constrain delivery. The ECF Impact Assessment[74],[75] reaches similar conclusions, noting that **time-to-grant can reach 313 days** (with an average of 240 days) **across major EU programmes**, generating "high administrative and opportunity costs." and emphasises that "complexity combined with a high administrative burden disincentivises participation."

[70] European Commission (2024) The Draghi report on EU competitiveness
[71] ECA (2023) Special report 22/2023: Offshore renewable energy in the EU – Ambitious plans for growth but sustainability remains a challenge
[73] European Commission (2023) Evaluation study of the European Framework Programmes for Research and Innovation for a Resilient Europe – Final Report Phase 1
[74] European Commission (2025) SWD_2025_555_1 Commission staff working document Impact Assessment Report on the European Competitiveness Fund
[75] European Commission (2023) Evaluation study of the European Framework Programmes for Research and Innovation for a Resilient Europe – Final Report Phase 1

ETIPWind also notes that time-to-grant is often longer than a year, access conditions vary between MS, and that few instruments provide predictable multiannual funding streams, which are needed for these kinds of large industrial CAPEX decisions. This finding was also confirmed in industry interviews conducted for this study, where manufacturers highlighted that lengthy procedures and administrative complexity can make participation in EU funding programmes difficult, particularly for projects focused on manufacturing scale-up. For wind manufacturing and scale-up projects, long time-to-grant can reduce the practical value of EU support because investment decisions often need to be made within specific market, procurement or factory planning windows. Where funding decisions arrive too late, firms may delay investment, reduce project scope or proceed without EU support, weakening the role of public funding in de-risking industrial scale-up.[76]

These challenges are likely to persist under the proposed MFF 2028–2034, as reflected in the Impact Assessment for the ECF. Evidence from the Impact Assessment indicates that, even under reform scenarios, expected improvements are limited: timelines are reduced by only around 5–10 days under enhanced coordination and by 10–15 days under a more integrated framework. While the future architecture aims to simplify access, procedural delays are likely to remain a constraint unless more substantial changes are introduced.

In comparison, a study drawing on interviews with the Chinese Science and Technology Exchange Centre reports that **China introduced a 120-day time-to-grant target**. The same study analysed a random sample from the national research and funding platform, of 20 biotechnology projects and found actual approval times of four to five months, broadly in line with this benchmark.[77] Moreover, China's rapid build-out of renewables is supported by streamlined administrative procedures, including fast-track approvals, integrated planning of generation and grid infrastructure and the creation of unified national market rules, which together minimise bureaucratic steps and enable outpaced deployment compared to EU's more fragmented permitting and funding system.[78]

Additionally, the ETIPWind report[79] mentions that EU funds include multiple relevant programmes which apply **divergent rules, data requirements and reporting obligations**, which reduces efficiency – especially when an investment must draw funds from multiple EU sources. The report also notes that sectoral expert groups (the SET Plan IWGs) are not consistently integrated into decision-making structures, prolonging programme design cycles and weakening the link between technical priorities and funding availability.[80] This fragmentation issue is further explored in driver 3 of this section.

Driver 2.2: Reactive funding and policy frameworks do not sufficiently anticipate sector challenges

EU funding and policy frameworks for wind energy remain largely reactive, **responding to problems once they materialise rather than anticipating structural challenges** facing the sector. Multiple recent assessments highlight that the wind industry is entering a phase characterised by intensifying global competition, rapid technological change and rising capital intensity, while public support instruments in the EU have not evolved at the same pace, as further discussed in Section 2.3.3. (Problem 3: Intensifying global competition). Evidence from recent energy-investment trends, trade flows and manufacturer performance indicates that competitive pressures are intensifying faster than EU policy responses, leaving gaps in support at critical stages of scale-up and deployment.

Against this background, three related shortcomings in EU funding and policy frameworks can be identified.

First, EU instruments have not adequately anticipated intensifying global competitive pressures facing the wind sector. The experience of solar PV illustrates the risk of reacting too late, as sustained

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[76] ETIPWind, EERA, WIND IWG (2025) From innovation to industrial competitiveness
[77] Heinrichs, G. et al., (2020) Comparison of innovation systems China and Germany, No. 9-2020
[78] WEF (2025) China's renewable energy boom has its own challenges. Here's what we can learn
[79] ETIPWind, EERA, WIND IWG (2025) From innovation to industrial competitiveness
[80] ETIPWind, EERA, WIND IWG (2025) From innovation to industrial competitiveness

manufacturing investment and industrial support contributed to a rapid shift in global PV manufacturing towards China.[81] Wind is not in the same position, as the EU retains a stronger industrial base and export position, but similar risks are emerging as outlined in driver 2.1, which shows that China-based wind turbine manufacturers receive substantially higher public support than OECD-based producers. This indicates that competitive pressures are already materialising in wind, and that EU funding tools risk remaining reactive rather than anticipatory.

Second, a risk-averse culture in public administrations has limited the ability of funding and policy tools to adapt to higher capital intensity and increased uncertainty. The Draghi report highlights that Europe does not coordinate sufficiently where it matters and that only a small share of public R&I spending takes place at EU level, while the ECF Impact Assessment identifies fragmented support across the investment journey and a lack of seamless funding from research to manufacturing.[82]

Third, EU funding priorities and instruments are not consistently shaped by timely industrial signals. Interviews conducted for this study with industry stakeholders highlighted that, while consultation mechanisms exist, they do not consistently translate industry signals into timely adjustments of funding programmes or policy frameworks. As a result, emerging challenges related to cost pressures, supply-chain constraints and manufacturing scale-up are not systematically reflected in funding design, reducing the ability of EU instruments to anticipate sector needs and target support effectively.

Together, these weaknesses reduce the EU's capacity to provide timely and targeted support as the sector moves from innovation to industrial scale-up.

Driver 2.3: EU and national programmes and instruments are fragmented and lack strategic focus

Wind innovation support in the EU is constrained by both insufficient funding and the fragmented way in which it is delivered. Support is dispersed across multiple EU and national instruments with different objectives, eligibility rules, timelines, and governance arrangements, limiting the ability to direct funding strategically across the value chain. As a result, public support does not consistently match needs across research, demonstration, manufacturing scale-up, infrastructure, and deployment, reducing its overall effect.

EU R&I support for wind is fragmented across multiple programmes

EU and national funding for wind energy is scattered across a wide range of instruments with differing objectives, rules and governance structures. ETIPWind's From Innovation to Industrial Competitiveness[83] shows that **wind-related R&I support is spread across twelve EU programmes**, each with multiple sub-programmes where wind typically represents less than three per cent of budgets, and each with different eligibility rules, timelines and reporting requirements. The ECF proposal stresses that fragmented support "across the investment journey" limits the mobilisation of long-term capital.[84] This fragmentation makes it especially difficult to assemble the large and time-sensitive funding needed for industrial scale-up and manufacturing expansion.

Analysis of 2021–2024 allocations confirms the fragmentation and low priority (also highlighted in Problem 1, driver 1) with **wind representing only around 1% of funding** under **Horizon Europe** (cluster 5: climate, energy and mobility), **under 2%** in the **Innovation Fund**, and **less than 1% in CEF**, despite wind's central role in delivering the EU's 2030 and 2040 targets (as shown in Table 2-1). The RRF provides the largest wind energy funding but typically provides loans for wind, whereas the other

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[81] IEA (2022) Solar PV Global Supply Chains

[82] Draghi notes that the EU dilutes resources across multiple national and EU instruments, that only around one tenth of public R&I spending takes place at EU level, and that Europe does not coordinate sufficiently where it matters. The ECF Impact Assessment identifies fragmented support across the investment journey as a key problem driver. European Commission (2024), The future of European competitiveness; European Commission (2025), Impact Assessment Report on the European Competitiveness Fund.

[83] ETIPWind, EERA, WIND IWG (2025) From innovation to industrial competitiveness

[84] European Commission (2025) Proposal for a Regulation of the European Parliament and of the council on establishing the European Competitiveness Fund

funds provide predominantly grants. The marginal shares for wind in the total budgets of multiple funding programmes, reinforces the lack of focus and dedicated support for wind energy.

Table 2-1 Share of wind funding (grants and loans) in major EU instruments (2021–2024) and how wind is supported

Programmes	Wind funding (*million EUR*)	% of total budget	How wind is supported
Horizon Europe **Cluster 5**	230.9	1.2%	Broad, technology-neutral clean-energy and mobility research, wind competes with many priorities.
Horizon Europe **Cluster 4**	18.7	0.1%	Funds enabling digital and industrial technologies, wind relevant only indirectly.
ERC	4.0	0.0%	Bottom-up frontier research with no technology prioritisation, wind appears only when proposed by investigators.
EIC	23.7	0.1%	Challenge-based and open calls, not wind-specific and highly competitive.
CETP	10.9	0.1%	Joint clean-energy R&I across wide themes; no dedicated wind priority.
Innovation Fund	363.5	1.9%	Supports large low-carbon demonstration projects and is technology neutral, so wind must score competitively.
CEF Energy	56.1	0.3%	Funds cross-border grid infrastructure with wind benefitting indirectly through offshore transmission integration.
CEF Transport	89.1	0.5%	Supports port and logistics upgrades that can serve offshore wind - not wind-specific.
EMFAF	1.8	0.0%	Focus on maritime economy, indirectly supporting wind through off-shore related activities.
Erasmus+	8.3	0.0%	Funds skills and training. Wind indirectly involved through general green-skills programmes.
RRF	7 046.6	37.6%	Largest source of wind-related investment, but only where Member States include wind in national plans.
ERDF	93.0	0.5%	Can support renewable or industrial projects, but allocations depend on MS/regional choices rather than specific earmarking.

As a case to demonstrate this point, a closer look at support for wind under the Innovation Fund shows that support extends beyond the projects formally labelled as 'wind', but remains fragmented across categories and project types across the manufacturing value chain, rather than being a structured wind-specific funding stream. Under the Innovation Fund only six projects are formally classified under the 'wind' category, with around EUR 164.6 million in EU contributions, including N2OWF, HIPPOW, NEXTFLOAT PLUS, CASTRO, and the Norse Airborne Wind Energy Project.[85] However, a broader set of Innovation Fund projects also support the wind value chain through manufacturing, component development, industrial scale-up, and operations, even where these are recorded under other categories. These include Fos3F, MEADOW, Trollhattan, VB1F, POWER, Next.Gen.Wind, NEMO, WINDPL, PIVOT, and RoboticRepair. This fragmentation reduces the strategic impact of funding by spreading support across disconnected project types, making it harder to build coherent investment pipelines and send a clear market signal to the wind industry.

Fragmentation is equally evident at national level. ETIPWind reporting shows that Member States provided around EUR 930 million for wind R&I in 2021–2023, but 75% of this came from just five countries (Germany, France, the Netherlands, Denmark and Spain). Several IWG members, including countries with strong wind-resource potential and likely future deployment needs, reported little or no wind R&I spending. The Strategic Energy Technology (SET) Plan intended to coordinate EU and national funding has not aligned these streams effectively: major donor countries (Netherlands and Denmark) are not consistently active in the Wind IWG, and joint actions remain limited.[86]

Structural fragmentation is visible across the EU R&I funding landscape more broadly, the pattern is not unique to wind: for example for renewable hydrogen, the ECA finds that EU support is scattered

[85] European Commission (n.d.) Innovation fund projects
[86] ETIPWind, EERA, WIND IWG (2025) From innovation to industrial competitiveness

across the RRF, Innovation Fund, Horizon Europe, CEF, InvestEU and Cohesion policy funds, with around EUR 18.8 billion (2021-2027 period) available but no clear pathways for hydrogen infrastructure developers to access funding.[87] Additionally, even within a single programme such as the RRF, evidence and milestone requirements differ across countries, increasing administrative uncertainty and the risk of delay, while developers often must resubmit similar proposals under multiple instruments because positive evaluations cannot be carried over. A separate ECA review of offshore renewable energy[88] identified 496 EU-funded projects worth around EUR 2.3 billion between 2007 and 2022, delivered through at least eight different instruments, and concluded that EU support remains fragmented and does not provide a coordinated, end-to-end deployment pathway. For wind energy, these unaligned rules and timelines make it difficult to assemble coherent, multi-source financing packages and slow Final Investment Decisions (FIDs).

Continued fragmentation risks are present in the MFF 2028–2034 architecture. According to the assessment of the ECA, there are **several structural risks associated with the MFF architecture**. Notably, the mechanisms ensuring effective coordination between Horizon Europe, the ECF and national funding remain insufficiently specified, with the report highlighting the absence of clear links with national reform and investment planning frameworks (e.g. the European Semester).[89] ECA also cautions that, despite the stated objective of simplification, key elements of governance, accountability and control remain unclear, and that the consolidation of multiple instruments into the ECF may increase complexity during implementation if roles and responsibilities are not clearly defined.[90]

Fragmentation has led to a lack of strategic focus and alignment

EU funding for renewable energy remains predominantly technology neutral and is not sufficiently directed towards strategic renewable technologies, such as wind. This neutrality, matched with funding fragmentation, lead to a lack of clear prioritisation and dedicated support for technologies essential to the EU's climate and industrial objectives, linking to problem 1, driver 1.

The Draghi Report[91], which lays out clear recommendations on how Europe can increase its competitiveness, found that **the current EU budget is "not allocated towards the Union's strategic priorities"** and that spending is hampered by "fragmentation, complexity and rigidity". In a similar vein, the ECF Impact Assessment finds[92] that **the EU faces a "persistent lack of directionality", with investment dispersed across many policy fields and limited concentration on key strategic technologies**. A primary cause of this issue is insufficiently targeted funding across strategic value chains, rather than an overall lack of funding.

The NZIA and IAA help strengthen the regulatory and industrial policy framework for net-zero technologies, but they do not themselves provide dedicated funding for these technologies. This leaves a financing gap, particularly at TRL 7–9, where demonstration, first industrial deployment and manufacturing scale-up require targeted de-risking and investment support.

A key feature of the fragmentation is the **lack of alignment across EU funding instruments**. Wind related projects must navigate a wide range of programmes such as Horizon Europe, the Innovation Fund, CEF, EMFAF, InvestEU, Cohesion policy funds and the RRF. Coordination mechanisms intended to reduce this fragmentation do exist. The SET Plan wind IWG[93] coordinates national R&I agendas for wind, ETIPWind[94] provides an industry-led platform to identify common R&I priorities, and the Wind Power Action Plan seeks to improve the framework conditions for the wind sector, including access

[87] ECA (2024) Special report 11/2024: The EU's industrial policy on renewable hydrogen
[88] ECA (2023) Special report 22/2023: Offshore renewable energy in the EU – Ambitious plans for growth but sustainability remains a challenge
[89] European court of Auditors (2025) Opinion 01/2026
[90] European court of Auditors (2025) Opinion 01/2026
[91] European Commission (2024) The Draghi report on EU competitiveness
[92] European Commission (2025) SWD_2025_555_1 Commission staff working document Impact Assessment Report on the European Competitiveness Fund
[93] European Commission (n.d.) Working groups – wind energy
[94] ETIPWind (n.d.) European technology and innovation platform on wind energy

to finance and project pipeline visibility. However, these mechanisms do not yet translate into a single strategic funding pathway across EU and national instruments. Wind projects therefore continue to rely on multiple technology-neutral programmes, with different rules and intervention logics, rather than a dedicated and sequenced route from R&I to demonstration, manufacturing scale-up and deployment.

2.3.3 Problem 3: Intensifying global competition

The European wind sector is facing intensifying global competition at a time when market and financing conditions have become more challenging for EU manufacturers. Rising input costs, higher interest rates, pressure on margins and growing competition from heavily supported non-EU producers are making it more difficult for European firms to maintain their industrial and technological position. As a result, the EU risks losing market share, investment capacity and resilience in a sector that is central to its energy transition and industrial competitiveness.

The evidence presented below points to two main drivers of this problem.

What we observe (based on the evidence below):

- **Driver 3.1:** Global competition is intensifying and market conditions for EU wind manufacturers have become more challenging, including through cost pressures, supply-chain risks and increasing competition from Chinese producers.
- **Driver 3.2:** Profitability pressures are reducing the capacity of EU industry to invest in innovation and industrial scale-up, while competitors benefit from stronger financial positions and public support.

Taken together, these findings show that European wind manufacturers are competing in a more demanding global environment while facing weaker conditions for reinvestment and expansion at home. This increases the risk that the EU will lose competitiveness in key export markets and become more exposed to external dependencies in strategic parts of the wind value chain. The following sub-sections examine these two drivers in turn.

Driver 3.1: Intensifying global competition and challenging conditions for EU industry

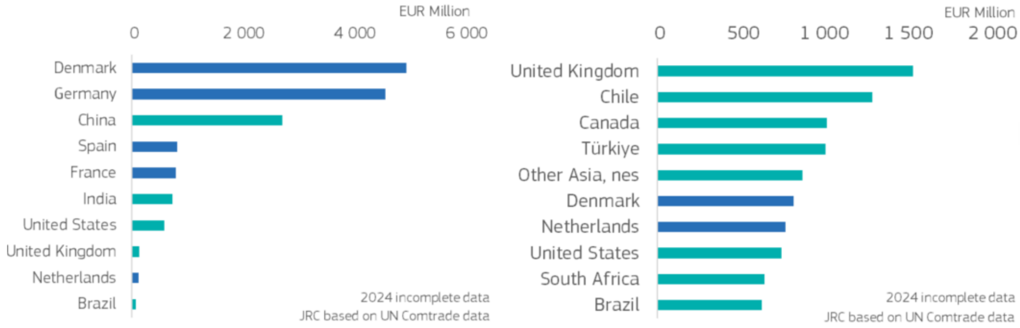
Recent analysis shows that Europe's wind sector is operating in a markedly **more challenging economic and competitive environment** than in previous investment cycles. The IEA World Energy Investment Report[95] finds that **rising input costs, higher interest rates and persistent supply-chain disruptions have weakened project economics and slowed the transition from demonstration to industrial scale-up**, despite continued growth in overall clean-energy investment.

The IEA further reports that several offshore wind tenders, including in Denmark, failed to attract bids as high inflation and financing costs rendered projects commercially unattractive. As demonstrated in Problem 1, Driver 3, these conditions disproportionately affect capital-intensive wind projects and with existing EU funding and risk-sharing instruments insufficient to stabilise investment conditions during periods of macroeconomic stress.[96]

At the global level, EU manufacturers remain major exporters, but their relative position is weakening. Trade and market data analysed by the JRC confirm that competitive pressures have intensified for the wind industry. Over 2022–2024, Denmark and Germany together accounted for more than 60% of global exports, however, China's global market share continued to rise. At the same time, global import demand has shifted towards a small number of large markets, notably the United Kingdom, Chile and Canada.

[95] IEA (2025) World Energy Investment 2025
[96] IEA (2025) World Energy Investment 2025

Figure 2-17 Top ten global exporters (left) and importers (right) in wind energy technologies (2022-2024)[97]



These trade dynamics are mirrored in global market structure. While European Original Equipment Manufacturers (OEMs) continue to dominate the EU market, their global market share has declined steadily over the past decade. In 2024, **Chinese OEMs accounted for 72% of global installations, compared with 21% for European OEMs**.[98] Noting that the largest part of global installations are occurring within China, which has allowed Chinese manufacturers to build up capacity and scale.

Excluding the de-facto closed Chinese domestic market EU OEMs position remains competitive and continue to supply a large share of global installations. EU wind manufacturing output remains substantial, valued at around EUR 10.5 billion in 2024. EU manufacturers supplied around 64% of onshore wind installations and 95% of offshore installations in the rest of the world (excluding China) in 2024.

The EU's competitive challenge is whether it can maintain its strong position in global markets as deployment in non-Chinese markets accelerates, and export competition from China increases. Maintaining competitiveness will require timely investment in manufacturing scale-up to avoid future loss of market share.[99] This needs to start soon as the EU industry position is threatened as Chinese OEMs increasingly look to export markets, a development that is already gaining traction, with growing exports, exceeding USD 5 billion in 2025.[100]

Competitive pressures are reinforced by Europe's dependence on Chinese-controlled supply chains for certain strategic inputs. For example, China holds a dominant position in rare-earth elements and permanent magnets used in modern wind turbine generators, leaving Europe dependent on imports of both raw materials and processed components.[101] At the same time, European developers remain cautious about using Chinese suppliers because of regulatory, political, and operational risks, even as cost pressures increase. [102]

Driver 3.2: Profitability pressures reduce capacity of EU industry to invest, competitors face less pressure

Differences in financial resilience affect the ability of firms to absorb risk and invest in innovation and scale-up, with European manufacturers facing more constrained conditions. An assessment of Siemens Gamesa (SGRE), Vestas, Mingyang and Goldwind, based on Earnings Before Interest and Taxes (EBIT) margins, free cash flow and order backlogs, (see Figure 2-18, Figure 2-19 and Figure 2-20)

[97] JRC (2025) Clean Energy Technology Observatory: Wind Energy in the European Union - 2025 Status Report on Technology Development, Trends, Value Chains and Markets
[98] JRC (2025) Clean Energy Technology Observatory: Wind Energy in the European Union - 2025 Status Report on Technology Development, Trends, Value Chains and Markets
[99] JRC (2025) Clean Energy Technology Observatory: Wind Energy in the European Union - 2025 Status Report on Technology Development, Trends, Value Chains and Markets
[100] Ember Energy (2026) China cleantech exports data explorer
[101] Oxford Institute for Energy Studies (2025) Chinese participation in Europe's offshore wind sector: the good, the bad and the unknown
[102] Oxford Institute for Energy Studies (2025) Chinese participation in Europe's offshore wind sector: the good, the bad and the unknown

reveals marked differences in financial resilience.[103] Financial data indicate that European OEMs are operating under tighter margin and liquidity conditions, with uneven recovery across firms. By contrast, Chinese OEMs generally exhibit more stable operating performance and stronger cash flow positions. Analysis of a selection of leading global original equipment manufacturers illustrates how rising costs, financing constraints and market uncertainty are affecting companies unevenly across regions.

Order backlog data provides insight into demand visibility and revenue stability. European OEMs generally maintain larger forward order books, although recent trends suggest some weakening in pipeline visibility. Chinese OEMs, by contrast, operate with smaller backlogs, implying greater exposure to demand volatility.

Figure 2-18 EBIT margin of selected OEMs, 2022-2025

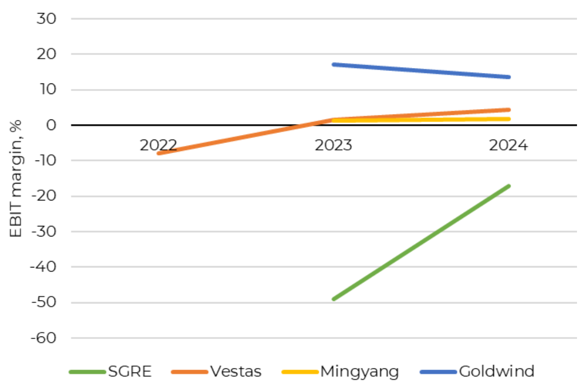


Figure 2-19 Free cash flow of selected OEMs, 2022-2025

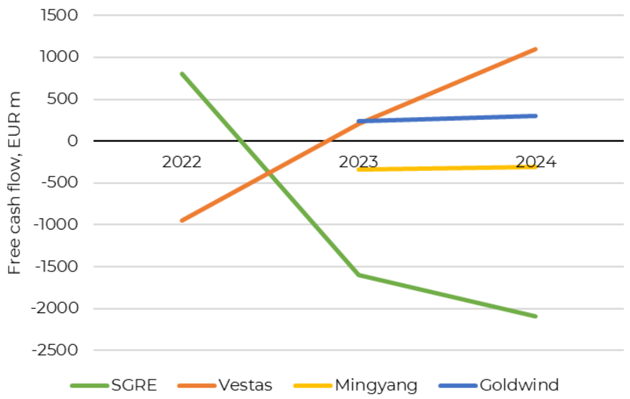
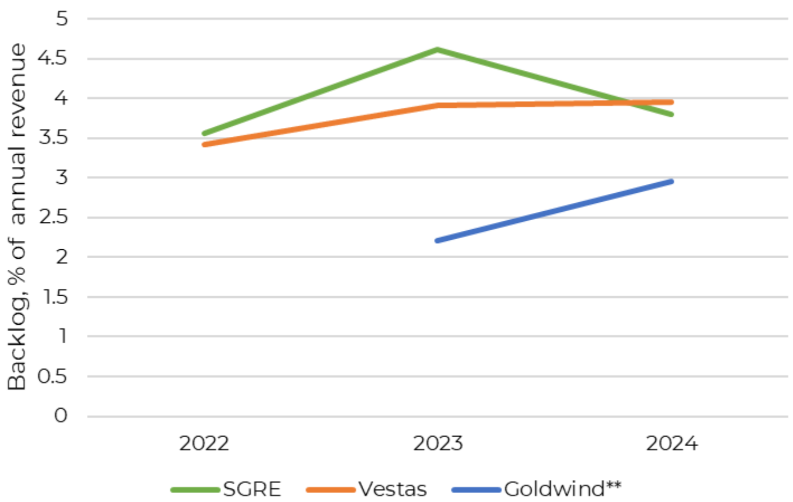


Figure 2-20 Order backlog of selected OEMs, 2022-2025

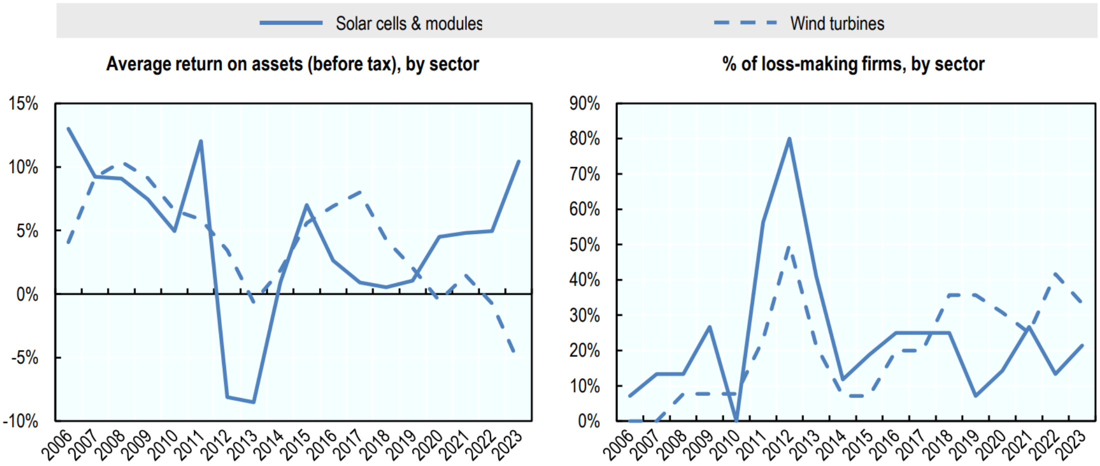


Chinese producers have maintained positive profitability over most of the past decade, with OECD analysis showing that public support measures have directly contributed to the expansion of Chinese industry production capacity and its ability to invest in new technologies.[104] **In contrast, EU wind producers have been struggling for profitability due to rising input costs, falling output prices and flat deployment rates in Europe.** The erosion of profitability in the sector has seen average returns on assets for wind turbine producers in OECD economies hovering around or below

[103] Own research based on 2022, 2023, 2024 financial reports of each OEM.
[104] OECD (2025) Trade policy paper, No. 288 - Government support in the solar and wind value chains

zero, and a high share of companies have operated at a loss in recent years, as shown in the Figure 2-21.[105]

Figure 2-21 Average return on assets and share of loss-making companies for wind turbine and solar module manufacturers, 2006–2023[106]



Taken together, these dynamics point to a growing asymmetry: **Chinese manufacturers face strong incentives to expand into export markets, including Europe**, to secure demand, while more constrained **European OEMs have limited capacity to absorb risk or scale investment**. This increases competitive pressure in European and other non-Chinese markets.

2.3.4 Synthesis: how the problems reinforce each other

Taken together, the three problems set out above reinforce each other and lead directly back to the **core challenge** identified at the start of this section: **a fragmented, underfunded and misaligned wind innovation and industrial scale-up landscape in Europe, which is endangering competitiveness, energy security and resilience, and Europe's leadership in wind energy**. This interaction creates a self-reinforcing cycle in which insufficient funding levels, weak de-risking and slow, fragmented delivery mechanisms reduce the bankable pipeline of projects and constrain the ability of European industry to invest and scale.

- **Underinvestment narrows the project pipeline (Problem 1), making delays and administrative burden more damaging (Problem 2):** when overall R&I funding volumes are limited (especially for **demonstration and industrial scale-up) fewer projects reach maturity**. In this context, long time-to-grant and high complexity (multiple funding sources, different requirements) can cause projects to miss investment windows, delay final investment decisions, or reduce scope.
- **Fragmented and non-interoperable support weakens the ability to crowd in private capital (Problem 2 → Problem 1):** divergent rules and gaps at key stages of the technology development process (particularly across the "double valley of death") increase perceived risk. This reduces the mobilisation of venture, growth and project finance, increasing the need for, and reliance on, public support.
- **Weak translation of innovation into deployment reduces feedback effects and investment capacity (Problems 1 & 2 → Problem 3):** when innovation does not translate into timely deployment, learning-by-doing, revenues and scale effects are weaker. This reduces firms' capacity to finance R&I and industrial investment, including in enabling infrastructure, and increases exposure to external competitive pressure.
- **Intensifying global competition raises the bar on scale and speed, widening the gap (Problem 3 → Problems 1 & 2):** competitors, especially in China, combine larger, faster and

[105] OECD (2025) Trade policy paper, No. 288 - Government support in the solar and wind value chains
[106] OECD (2025) Trade policy paper, No. 288 - Government support in the solar and wind value chains

more predictable support with stronger market scale. This puts pressure on EU manufacturers' margins and cash flow, reducing their ability to co-finance innovation and scale-up and making EU-level delays and fragmentation comparatively more costly.

- **The combined effect is persistent fragmentation and misalignment along the innovation-to-industrialisation pathway:** rather than a sequenced pipeline from research to demonstration, industrial scale-up and targeted market uptake, the EU wind sector faces gaps between instruments, uneven support across Member States and limited strategic focus. This reduces Europe's ability to maintain its leadership and to deliver on the wind energy deployment needed for energy security and resilience.

This synthesis indicates why the core problems are likely to persist without targeted action: **addressing only the level of funding (Problem 1) without improving delivery mechanisms (Problem 2) would not reflect the urgency of the problem, leaving Europe too slow and fragmented to translate resources into industrial outcomes**; conversely, **streamlining instruments without sufficient scale and de-risking would not create a strong enough pipeline to withstand intensifying global competition (Problem 3)**. In other words, the problems are mutually reinforcing and require a coherent response that combines greater critical mass of public R&I and scale-up investment which is faster, more strategically targeted and better aligned with other support and across the innovation chain. The next section therefore assesses why Europe needs to act at EU level and what added value a dedicated approach could provide.

2.4 Conclusion: Europe needs to act

The European wind industry is facing intensifying competitive pressure and must innovate and industrialise faster to maintain leadership. Wind is a strategic net-zero technology and a cornerstone of Europe's clean-tech industrial base and energy transition. Its technological, economic and societal contributions—and why wind-sector innovation and industrial strength are central to Europe's wider competitiveness—are set out in Section 2.1.

Sections 2.2 and 2.3 show that Europe's current support landscape is not sufficient to address the core challenge identified in this chapter: a fragmented, underfunded and misaligned wind innovation and industrial scale-up landscape in Europe, which is endangering competitiveness, energy security and resilience, and Europe's leadership in wind energy. The problem is driven by three mutually reinforcing weaknesses.

First, **public wind R&I investment remains too low relative to competitors, with China estimated to spend 3-9x more than the EU, and to the scale of the EU's wind deployment ambition**, with the most acute gaps at demonstration and industrial scale-up (Problem 1). Second, **EU instruments are often too slow, complex and insufficiently interoperable for industrial decision timelines**, with time-to-grant typically 9-11 months and even ECF simplifications only shave 5-15 days from these timelines, limiting the speed at which projects progress along the innovation chain (Problem 2). Third, **global competition is intensifying**, while EU manufacturers face profitability and investment constraints that reduce their capacity to co-finance innovation and scale-up (Problem 3). If left unaddressed, the consequences set out are likely to materialise, including reduced technological leadership, greater dependency on non-EU suppliers and weaker resilience and security of supply.

The proposed Horizon Europe and ECF architecture creates opportunities, but is not expected to resolve these structural weaknesses on its own. Without clearer prioritisation, critical mass and delivery mechanisms tailored to the wind innovation-to-industrialisation pathway, particularly the weaknesses in the second 'valley-of-death', there is a material risk that wind priorities remain diluted within broad, technology-neutral programming, that funding remains discontinuous across technology readiness levels (with particular gaps at levels 7-9), and that time-to-grant and administrative burden continue to constrain industrial participation and final investment decisions. This is compounded by potential gaps in the MFF 2028–2034 proposals, with those most relevant to wind and the broader clean-tech base summarised in the Table 2-2 below.

Failure to address structural and specific weaknesses could lead to the situation where wind innovations no longer industrialise in the EU and manufacturing expansion occurs elsewhere. The combinations of the uncertainties, risks and gaps highlighted above, lead to weaker project pipelines, reducing the crowd-in of private investment and delays or cancellations of investments in demonstrators and manufacturing lines. This could lead ultimately to the situation that wind innovations don't industrialise in the EU and manufacturing scale up is located outside the EU, leading to losses of EU competitiveness, jobs and GVA.

An intervention in wind innovation and competitiveness can remain proportionate by focusing on the key market and coordination failures identified in Section 2.3, complementing Horizon Europe and other instruments rather than replacing them, and avoiding broad deployment subsidies for mature projects (which are addressed through other policy and funding channels). Taken together, these gaps show that without a more focused EU-level approach, the conditions that underpin the core problem are likely to persist: insufficient critical mass of investment (Problem 1), slow and fragmented delivery (Problem 2), and a worsening competitive position in global markets (Problem 3). This justifies a response that combines **scale** (to close investment and de-risking gaps), **speed and interoperability** (to match industrial decision timelines), and **strategic focus** (to reinforce EU competitiveness and resilience in a sector facing intensifying global competition).

Table 2-2 Potential gaps of the MFF 2028-2034 with regards to the European wind industry

Lacks critical mass of funding proportionate to challenge scale	Competition with economies where public support levels are structurally higher requires significant European-level investment, but the MFF proposals do not address this issue by considering dedicated envelopes to wind or other relevant net zero technologies. Funding for industrialisation remains largely technology neutral and broad, based on current proposals.
Funding allocation remains uncertain and short-term, lacking long-term visibility	Funding for wind under Horizon Europe and the ECF continues to be defined through year-to-year or bi-annual programmes, with no multi-annual certainty on the volume, continuity, or targeting of support for the sector. This uncertainty discourages long-term industrial investment, delays manufacturing scale-up, and weakens Europe's ability to crowd in private capital.
Risks maintaining fragmented, complex, and slow funding architectures	MFF proposal risks perpetuating slowness and administrative burden due to existence of different instruments (Horizon Europe, ECF, Innovation Fund and others), divergent rules, long time-to-grant, and limited interoperability. Impact on administrative delays appears limited: expected improvements amount to up to 10–15 days on major EU programmes, according to the ECF Impact Assessment.
Consultation with sector may remain limited and non-systematic	The MFF foresees annual work programmes decided by the Commission, risking insufficient industry involvement and a misalignment between Horizon Europe/ECF actions and the wind sector's actual innovation agenda.

This creates a clear rationale for EU-level action, in line with subsidiarity, EU added value and proportionality considerations. Wind innovation, testing infrastructures, supply chains and project pipelines are structurally pan-European, while the benefits of investment (knowledge spillovers, technology diffusion, resilience and competitiveness) accrue across borders. Member States acting alone are unlikely to provide sufficient scale and continuity, and fragmented national approaches risk widening existing disparities and creating inefficient duplication or subsidy races. **EU action can add value by pooling resources, providing multiannual visibility, and creating a more coherent pathway across the innovation chain—especially for demonstration and industrial scale-up where capital intensity is high and private finance is hardest to mobilise**.

A dedicated, ring-fenced wind window under the ECF would be an appropriate and proportionate delivery vehicle for this EU action. It can provide (i) **critical mass and multiannual visibility** of support to close the investment and de-risking gap, particularly in the "double valley of death" where the uncertainty and risks of first-of-a-kind and industrial scale-up projects prevent bankability and reduces the successful application of existing repayable finance instruments e.g. from the EIB; (ii) **faster and more interoperable delivery** through a clearer execution layer and better alignment of instruments along the innovation chain; and (iii) **strategic directionality** aligned with EU frameworks (e.g. NZIA, SET Plan, Wind Power Action Plan) to strengthen competitiveness and resilience. Importantly, such an approach can remain targeted: it does not replace Horizon Europe's role in upstream research, nor does it act as a general deployment subsidy for mature wind farms. Rather, it addresses the specific market and coordination failures identified in Section 2.3 by supporting wind-specific priorities at demonstration, industrialisation and scale-up stages and by crowding in private investment through risk-sharing instruments where appropriate. Chapter 3 therefore sets out what a Wind Fund could look like in practice and assesses the impacts it could deliver relative to a business-as-usual scenario.

3 Assessment of the impacts of a Wind Fund

Key points

- **A dedicated Wind Fund could deliver substantial added value compared to a baseline scenario without structural change.** By concentrating resources and aligning support across the innovation chain, the Fund would address the key investment, scale-up and delivery failures identified in Chapter 2.
- **The Wind Fund would significantly strengthen Europe's scientific and technological leadership in wind energy.** Scaled-up, wind-specific support spanning research, demonstration and industrialisation would expand the pipeline of innovative projects, increase high-value patents and applied innovation, and strengthen collaboration between research organisations and industry, particularly at higher technology readiness levels.
- **The Wind Fund could improve the competitiveness and scale of the European wind manufacturing base.** By de-risking industrial scale-up, supporting manufacturing investment and enabling infrastructure, and accelerating cost reductions, the Wind Fund could help raise EU production value to over EUR 120 billion by 2040, strengthening export performance and domestic value creation.
- **Economic impacts would be substantial and highly leveraged.** The analysis indicates that each euro of public funding could return around EUR 7 per year in economic value, contributing around EUR 33 billion per year in additional gross value added by the 2030s compared to a scenario without a Wind Fund, supporting up to 180 000 **additional jobs, and significantly increasing export value compared with the baseline.**
- **Benefits would extend further to energy security, system resilience and open strategic autonomy.** Higher deployment supported by a stronger European industrial base would increase the share of EU-sourced equipment and services, reduce import dependency, and displace an additional ~70 bcm of fossil gas per year by 2040, equivalent to around 700 Liquefied Natural Gas (LNG) **shipments.**
- **The Wind Fund would strengthen progress towards EU climate and energy targets**. By enabling higher and faster wind deployment, particularly in offshore and floating wind, the Wind Fund scenario would support nearly 100 GW of additional installed capacity by 2040, deliver substantial additional renewable electricity generation, and avoid up to 120 MtCO_2e of additional emissions annually by 2040 relative to the baseline.

The European wind sector faces structural underinvestment in research, innovation and industrial scale-up, a fragmented and increasingly misaligned funding landscape, growing competitive pressure from non-EU players and a widening gap between the ambition of EU climate targets and the capacity of the European industry to deliver on them.

This chapter sets out what a dedicated European Fund for Wind Research & Competitiveness (the Wind Fund) would look like, what it is designed to achieve and what difference it would actually make. The analysis is structured around two questions.

(1) what would the Wind Fund do in practice: what activities would it support (section 3.1.2), at what scale (section 3.1.3) and through what mechanisms (section 3.1.4).

(2) what impact can we realistically expect on the EU's scientific and technological leadership, on its industrial competitiveness and on its ability to deliver clean energy at the pace the energy transition demands (Section 3.2).

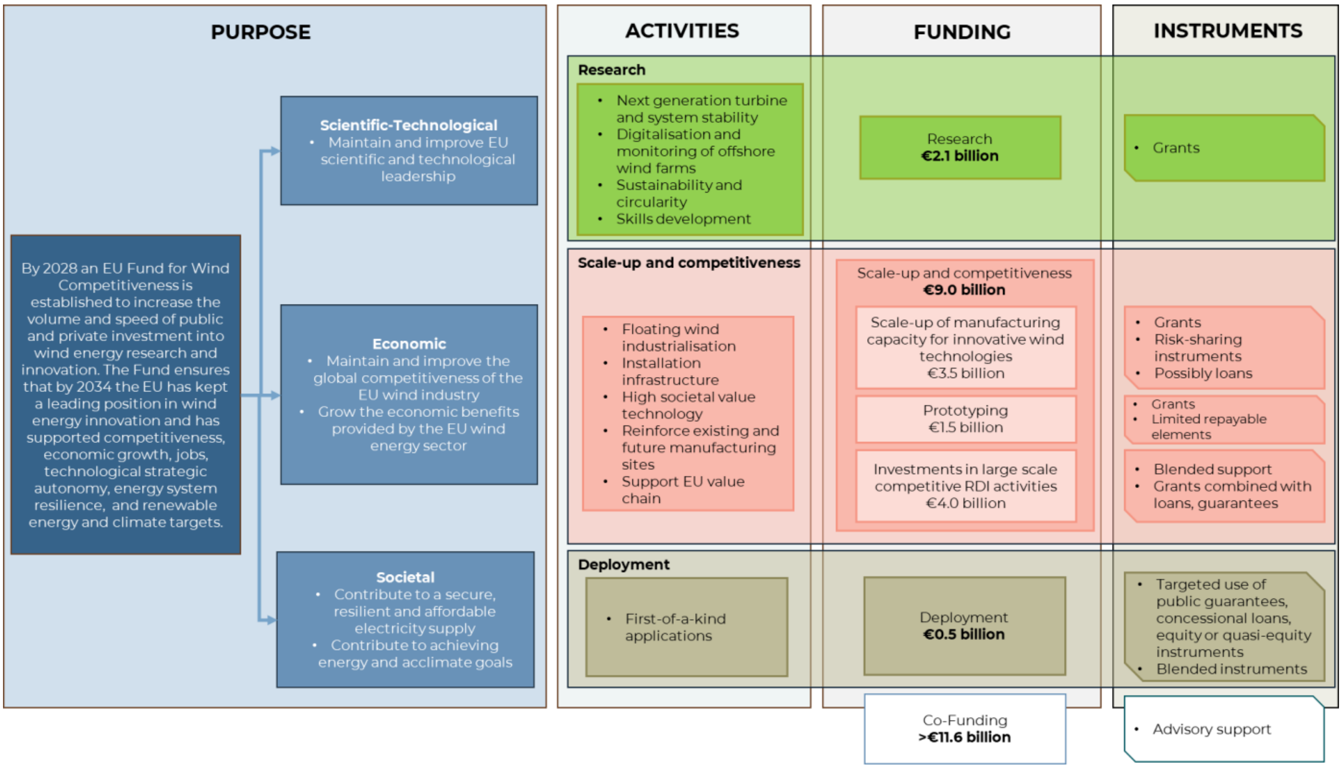
The impact assessment that follows compares two scenarios: a baseline in which EU-level wind funding continues through existing or similar instruments without a structural change, and a Wind Fund scenario in which a dedicated, ring-fenced wind window under the ECF provides scaled-up, strategically focused support over 2028–2034. The comparison is drawn across three dimensions, namely scientific/technological, economic, and societal, and is grounded in both quantitative modelling and qualitative analysis.

3.1 What would the Wind Fund look like?

3.1.1 Overview

A dedicated Wind Fund would be established under the ECF as a technology-specific mechanism to centralise **EU support for wind energy research, innovation and industrial scale-up** across 2028–2034 (while technology deployment support for wind farms would be supported by other EU programmes and Member States, except for innovative wind deployment technologies). The Wind Fund would support also related innovation in system integration areas that are essential for wind deployment, including grid connection and reinforcement, storage, digitalisation, flexibility and enabling infrastructure. The Wind Fund is proposed as a single regulatory framework consolidating multiple EU funding streams under a more integrated execution model to strengthen EU competitiveness and accelerate market uptake of strategic technologies. An overview of the Wind Fund is provided in Figure 3-1 and further elaboration of each of the main elements is provided in the following sub-sections.

Figure 3-1 Overview of proposed European Fund for Wind Research & Competitiveness



3.1.2 Purpose

The Wind Fund would have dedicated objectives aligning with the needs of the industry and the identified problems and causes. For this exercise we propose the following objectives:

General objective

By 2028 the Wind Fund is established to increase the volume and speed of public and private investment into wind energy R&I. The Wind Fund ensures that by 2034 the EU has kept a leading position in wind energy and has supported innovation, industrial scale-up, competitiveness, economic growth, jobs, technological strategic autonomy, energy system resilience, and renewable energy and climate targets.

Specific objectives

Specific objectives are also established to more clearly define the objectives to be achieved by the Wind Fund:

Scientific / technological

- **Maintain and improve EU scientific and technological leadership:** the EU is amongst the global leaders in wind energy research, innovation and technology. The Wind Fund maintains, and where possible, improves by 2034 European leadership in innovative wind technologies.

Economic

- **Maintain and improve the global competitiveness of the EU wind industry:** as shown in section 2.1 the EU is the global leader in international markets (excluding China) for wind energy, these exports provide important economic benefits to the EU. However, as shown in Section 2.3.1, this position is starting to be challenged. This objective reflects the Wind Fund's aim to maintain and improve the EU industry's strong competitive position through ensuring the EU is able to demonstrate and scale-up manufacturing capacity in wind energy technologies, thus also contributing to ensure the EU independence in the supply of wind energy technologies.
- **Grow the economic benefits provided by the EU wind energy sector:** as outlined in section 2.1, the EU wind industry makes major contributions to the EU economy. By increasing the speed and volume of funding, the Wind Fund bolsters the competitiveness of the sector. Innovation through the Wind Fund improves the cost competitiveness of EU suppliers and support them in bringing new technologies to the market faster, helping to bridge the 'valleys of death' outlined in Figure 2-11. This objective aims for economic indicators (i.e., gross value added, employment) to increase relative to a baseline growth scenario by 2040.

Societal

- **Contribute to a secure, resilient and affordable electricity supply:** the development and deployment of innovative wind energy technologies supports growth in domestic energy supply. R&I and industrial scale-up contributes to cost reductions, increased availability and better system integration all of which will contribute to a more affordable, resilient and secure EU electricity supply during and after the MFF.
- **Contribute to achieving energy and climate policy goals:** emissions reductions and renewable energy targets are important policy goals to which the EU wind industry already substantially contributes. The Wind Fund further boosts the contributions that wind energy can make to these targets, aiming to increase deployment by 100 GW in 2040 relative to a baseline growth scenario, saving an estimated 11.9 $MtCO_2e$ of annual GHG emissions.

3.1.3 Which innovation and competitiveness activities would be funded?

Funding under the proposed Wind Fund would be structured around the six strategic priorities identified in the SET Plan Offshore Wind Implementation Plan and the ETIPWind SRIA, as detailed in the Table 3-1 below, but grouped into the three broader categories reflecting the main stages of the innovation and industrial value chain, namely research, scale-up and deployment. However, the three categories are not completely distinct as several of the strategic priorities span more than one stage, moving from research and validation to industrial scale-up and, in some cases, targeted first-of-a-kind deployment.

Table 3-1 Alignment of wind sector priorities and the contribution of Wind Fund

Main funding category	Strategic priority	Examples of Wind Fund activities
Research / deployment	1. Next-generation turbines and system integration	· Support R&I, testing and integrated pilots for advanced turbines, forecasting, storage, grid optimisation and system integration
Research / scale-up	2. Offshore wind digitalisation and monitoring	· Support digital tools, predictive maintenance, interoperable data systems, cybersecurity and fleet-scale monitoring solutions
Research / scale-up	3. Sustainability and circularity	· Support new materials, recycling technologies, rare-earth substitution, life extension and circular value chains
Research / scale-up	4. Skills, human capital and education	· Support curricula, training schemes, reskilling and sector-wide workforce development
Scale-up / deployment	5. Floating wind and industrialisation	· Support industrial scale-up, manufacturing capacity, certification, port and logistics readiness, and early commercial projects
Scale-up	6. Infrastructure, installation and cabling	· Support installation innovation, cable solutions, testing platforms, standards, and enabling port and transport infrastructure

The Wind Fund would allocate spending across a few key areas, with the activities to be supported in the Table 3-1 matching to one or more of these categories:

1. Research would focus on lower TRL support:

- **Next-generation turbine and system integration:** this includes integrated forecasting, grid optimisation, short-term storage, and the ability to operate in power systems with very high shares of renewables. The objective is to ensure that wind energy contributes to system reliability and resilience. To that end, the Wind Fund would enable large-scale demonstration projects and integrated pilots that combine forecasting, storage, grid optimisation and grid-forming capabilities.
- **Digitalisation and monitoring of offshore wind farms:** lifetime assessment, condition monitoring, smart operational tools and predictive analytics are identified as essential for improving reliability, reducing downtime and extending asset life. In this area, the Wind Fund could support fleet-scale deployment of digital twins, predictive maintenance platforms and interoperable data standards, moving beyond fragmented pilot projects. Furthermore, dedicated support for cybersecurity and standardisation would strengthen reliability and reduce operational risk across European fleets.
- **Sustainability and circularity**: blade recycling, development of sustainable materials, rare-earth substitution, life extension of wind farms, and the co-design of wind projects with environmental and social contexts. The transition from demonstration to industrial-scale circular solutions is clearly identified as necessary for long-term sector resilience. The Wind Fund could therefore boost the circularity of the existing technologies and support the sustainability of the new ones.
- **Skills development**: expanding and harmonising wind energy education, upskilling and reskilling the workforce and strengthening societal acceptance are considered prerequisites for delivering the deployment volumes envisaged for 2030 and beyond. Towards that direction the Wind Fund could establish structured support for education, reskilling and upskilling, to ensure that technological advancement is matched by workforce readiness.

2. Scale-up and competitiveness would represent the core of the Wind Fund and would focus primarily on those priorities where the greatest financing needs arise in moving from innovation to industrial application.

- **Installation infrastructure**, including installation and cabling innovation, including dynamic cables, repair solutions, harmonised standards and improved construction methods. To that end, the Wind Fund could co-finance innovative installation methods, cable reliability demonstrators and harmonised testing platforms, reducing project execution risk and improving scalability of offshore deployment.
- **Floating wind industrialisation**, including component and material validation, development of sustainable and standardised manufacturing processes, optimisation of integrated design, and scaling up serial production. The Wind Fund would help de-risk first-of-a-kind manufacturing lines, support port and logistics upgrades, accelerate certification and standardisation processes, and co-finance early commercial-scale floating arrays.
- **High societal value technology**, including sustainable material manufacturing processes or environmental co-design approaches. The Wind Fund could co-finance demonstration projects with a proven societal contribution, including supporting recycling processes upscaling.

3. Deployment would be more targeted and would support a limited number of innovative or first-of-a-kind applications in deployment of wind energy with strong system value, especially in areas such as floating wind, system integration solutions, smart storage systems, hybrid plant controllers, and other projects that help bridge the gap between industrial scale-up and bankable market uptake. This could also include supporting certification schemes and port and logistics readiness. The Wind Fund would therefore not act as a broad deployment subsidy, but as a targeted instrument to accelerate commercialisation where risks remain too high for the market alone.

3.1.4 How much funding is requested?

According to WindEurope, a **total EU public funding envelope of EUR 11.6 billion over 2028–2034** (EUR 1.66 billion per year) is estimated for the Wind Fund, split as follows:

- **Research**: EUR 2.1 billion: this is based on the request for an annual average EUR 600 million in public support over the 7-year period (2028-2034), a total of EUR 4.2 billion. It is intended that the Wind Fund provides 50% of the total, with the remainder of the public funding coming from other public sources, such as those described earlier in section 2.3. Industry and research organisations would also provide matching contributions to many of the funded R&I activities.
- **Scale-up and competitiveness**: EUR 9.0 billion: this funding request is based on analysis of historical project data, projected wind energy capacity growth, cost assumptions and stakeholder inputs. Stakeholder inputs were used to complement and validate cost estimates from public data and were gathered through a supply chain workshop carried out during the course of the work. The scale-up and competitiveness part of the Wind Fund would cover a variety of activities, including supporting:
  - **Scale-up of manufacturing capacity for wind technologies** (EUR 3.5 billion) which would fund increases in EU capacity for competitive manufacturing of key components such as nacelles, blades, gearboxes, towers, convertors and generators.
  - **Prototyping** (EUR 1.5 billion) based on analysis of existing Innovation Fund and national programme project sizes and industry needs. Similar levels of activities would be expected in the 2028-2034 period. This would fund prototyping of first-of-a-kind wind technologies (turbines, components, wind farm and systems), including demonstrations in commercial wind farms.
  - **Investments in large scale competitive Research and Innovation activities** (EUR 4 billion) based on analysis of projects financed by the EIB in the last 5 years, with project sizes ranging from EUR 100- EUR 1 200 million (avg. EUR 450 million), and financing of 30-75% (avg. 51%) of the project cost. The Wind Fund would similarly fund or finance large scale activities with turbine and/or component OEMs or developers,

using a mix of instruments as described in the following section, but also leveraging similar levels of private investment.

- **Deployment**: EUR 0.5 billion: this funding request would support the deployment of innovative wind technologies. Complementing the other categories of funding and helping to bridge these technologies from the second 'valley of death' to full commercialisation.

Overall, it is expected that the Wind Fund would achieve at least a 50% co-funding rate, therefore mobilising at least EUR 11.6 billion in additional private resources over the same period as a conservative baseline. Higher leverage levels are plausible where guarantees, loans, equity and blending are used (see the following section for a discussion on the funding instruments the Wind Fund would make available, and section 3.2.1 for a discussion on the public/private leverage ratio and co-financing rates).

3.1.5 Which instruments would the Fund use to support innovation and competitiveness?

The proposed Regulation establishing the ECF[107] provides that EU support may be delivered using the full set of tools available under the Financial Regulation, including grants, procurement, loans, guarantees, equity, quasi-equity and blending operations, with budgetary guarantees and financial instruments made available horizontally across the ECF under a common rulebook and through a single gateway for applicants. Within this framework, the ECF is designed to mobilise a broad financial toolbox, alongside advisory and business support measures. A key objective of the ECF toolbox is to maximise leverage, i.e. the amount of total investment mobilised per euro of EU support, by using public funding strategically to de-risk projects and crowd in private capital. Accordingly, the Wind Fund could combine grant-type support for targeted innovation or competitiveness building activities, with de-risking and investment instruments to support industrial ramp-up, supply chain expansion and deployment-oriented financing.

The Impact Assessment accompanying the ECF Regulation identifies the fragmentation of instruments, limited flexibility across programmes and insufficient mobilisation of private investment at scale-up and commercialisation stages as key weaknesses of the *current* funding landscape.[108] It concludes that an integrated **instrument toolbox** under a single framework performs significantly better (compared to the baseline and enhanced coordination between current funding programmes) in terms of effectiveness, efficiency and leverage, particularly for capital-intensive clean technologies.

Table 3-2 Financial instruments under the ECF financial toolbox

Instrument	Brief definition	Use under the ECF
Grants	Non-repayable Union funding to support specific activities, usually with co-financing.	Primary instrument for research and early-stage innovation. Progressively complemented by repayable instruments at later stages, while remaining applicable where commercial viability gaps exist.
Loans	Repayable financial support, potentially on concessional terms.	Used for scale-up and deployment where revenues are foreseeable, but risk or cost of capital remains high.
Equity	Provision of capital in return for partial ownership and profit participation.	Public risk-sharing capital to crowd in private investors for scale-ups and strategic value chains, implemented via financial partners.

[107] Proposal for a Regulation of the European Parliament and of the Council on establishing the European Competitiveness Fund, COM(2025) 555 final, Article 12.
[108] Impact Assessment accompanying the proposal for the European Competitiveness Fund, SWD accompanying COM(2025) 555 final.

Instrument	Brief definition	Use under the ECF
Quasi-equity	Hybrid instruments between debt and equity (e.g. subordinated or convertible instruments).	Used to absorb higher risk while limiting balance-sheet pressure on firms, particularly for industrial scale-up.
Budgetary guarantees	Union commitment to cover defined financial risks if specified events occur.	Core de-risking tool enabling loans, equity and other instruments and maximising leverage and private capital mobilisation.
Risk-sharing instruments	Instruments that allocate defined risks between public and private actors.	Used to address market failures and unlock private investment in higher-risk strategic projects.
Blending	Combination of grants with repayable financial instruments.	Used to tailor support to project needs and maximise leverage across the investment journey.
Public procurement	Purchase of goods, services or works by public authorities under EU rules.	Used to create lead markets and support first-of-a-kind or strategic deployment.
Venture capital	Private equity financing seeking high returns through exits.	Not the primary ECF model; private VC may be crowded in alongside public risk-sharing instruments.

Against this background, a Wind Fund under the ECF would distribute instruments along the wind value chain, matching the form of support to the risk profile and maturity of activities.

Instrument use along the wind value chain

Research:

- Predominantly **grant-based** support
- Justified by high technological uncertainty / too risky for commercial finance
- Supports collaborative research, early-stage innovation and system-level R&I
- Consistent with the ECF Regulation provisions on grants and with the Impact Assessment emphasis on preserving strong upstream research support

Prototype and early demonstration

- Continued use of **grants**, potentially **combined with limited repayable elements** where appropriate
- Supports validation of performance under real-world conditions
- Addresses gaps between research and commercial finance identified in the Impact Assessment

Product development

- Increasing use of **blended support** combining grants with loans or guarantees
- Reduces bankability gaps as capital needs rise and technical risks persist
- Enabled under the ECF Regulation, which allows combinations of non-repayable and repayable support[109]
- Responds to the Impact Assessment's identification of financing gaps at late TRL stages[110]

Commercialisation

- Greater reliance on **risk-sharing instruments** such as guarantees and concessional loans, with **possible use of loans** where commercial viability gaps remain.
- Supports first industrial deployment, manufacturing ramp-up and supply-chain expansion
- Designed to crowd in private lenders and reduce the cost of capital

[109] COM(2025) 555 final, Article 12(6-7).
[110] SWD accompanying COM(2025) 555 final, Sections 2.2 and 7.1.

Market maturity

- Targeted use of public guarantees, concessional loans, and equity or quasi-equity instruments to address residual market failures and crowd in private investment
- Instruments deployed through EU financial partners and blended with private capital, with a focus on risk-sharing rather than venture capital or permanent public ownership
- Focus on strengthening EU-based supply chains, resilience and industrial competitiveness
- Limited and proportionate public intervention as technologies approach full commercial viability, consistent with the additionality principle set out in the ECF Impact Assessment under Options B and C[111]

Advisory support

The ECF Regulation establishes a centralised **Project Advisory** function available for both repayable and non-repayable instruments.[112]

For the Wind Fund, advisory support would:

- improve preparation and structuring of projects across all value-chain stages
- reduce administrative and transaction costs for beneficiaries
- support SMEs and scale-ups in accessing appropriate funding instruments

3.1.6 Coherence with other Wind innovation and competitiveness funding

Under the baseline scenario, EU-level support for wind R&I would continue to come from instruments such as Horizon Europe, the Innovation Fund, CEF and, where relevant, cohesion policy funds allocated according to the National and Regional Partnership Plans. The baseline estimates (see also section 2.3.1) suggest total EU-level wind-relevant funding of around EUR 2 billion over 2025–2034, equivalent to around EUR 200 million per year (with additional national funding as is the case at the present).

The Wind Fund would significantly increase the EU-level funding. Its complementarity with other instruments would be reflected in the type of activities supported. Horizon Europe or its successor would remain the main vehicle for open and cross-sectoral research and collaborative innovation, whereas the Wind Fund housed under the ECF would provide more targeted support for wind-specific priorities identified in the SET Plan and ETIPWind SRIA (and coordinate funding within Horizon Europe). Likewise, CEF and Cohesion policy funds would continue to support broader infrastructure and regional development objectives, while the Wind Fund would focus on the wind-specific innovation, manufacturing, industrial scale-up and enabling investments needed to strengthen the European value chain. The Innovation Fund, or any successor mechanism, would continue to support decarbonisation and first-of-a-kind projects on a cross-sectoral basis, whereas the Wind Fund would ensure that wind-related industrial scale-up and deployment needs are addressed in a more predictable and strategic way.

The main coherence principle is therefore one of additionality and complementarity. The Wind Fund would not replace the baseline funding architecture, but fill gaps left by general EU instruments and provide a dedicated strategic focus for the wind sector. This would help avoid overlap and ensuring that wind energy, as a key strategic technology for the EU's decarbonisation, resilience and competitiveness objectives, receives support at a scale and with a continuity that existing instruments alone are unlikely to provide.

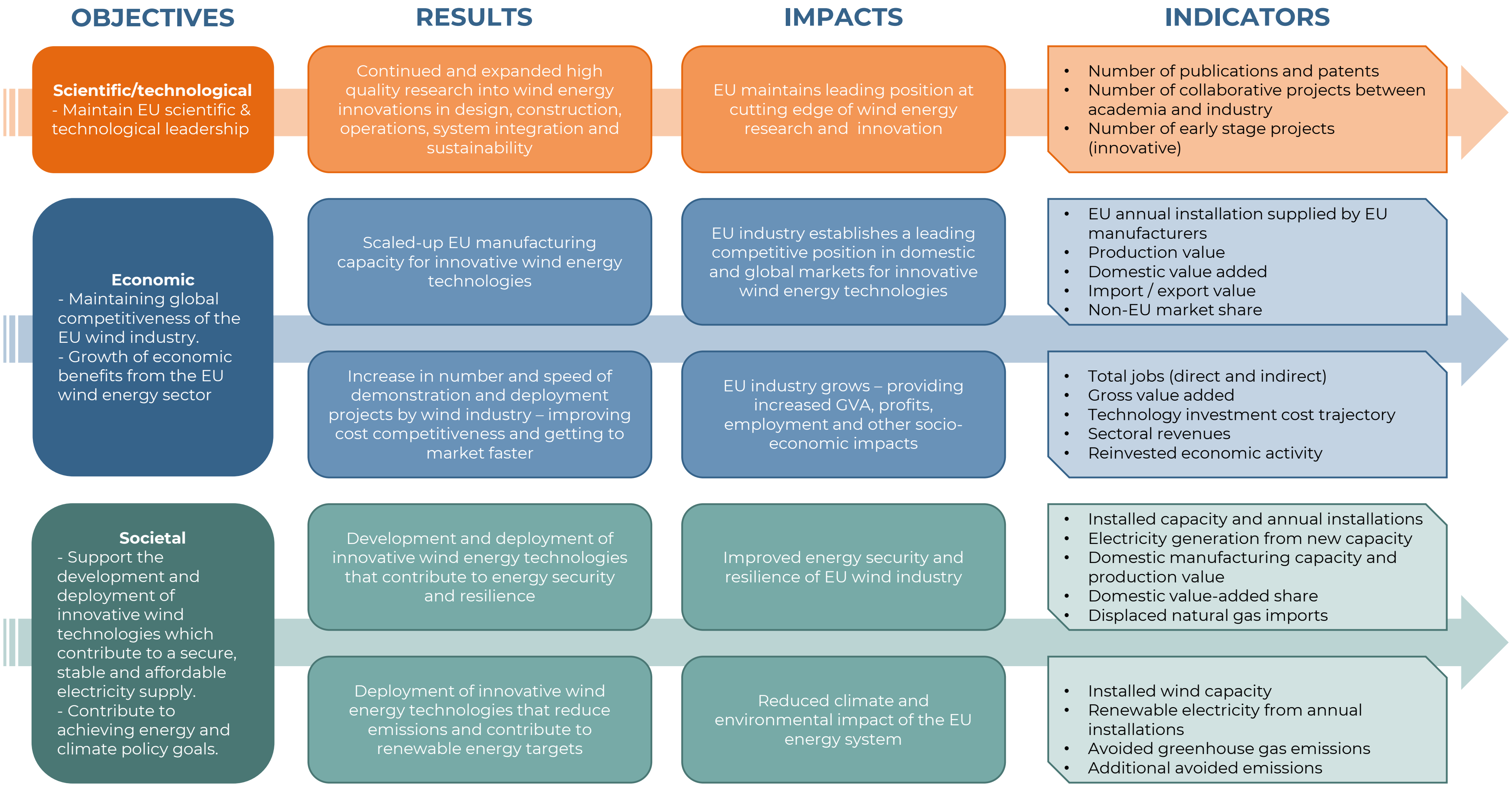
[111] SWD accompanying COM(2025) 555 final, Section 6.2.3.1 (additionality and market impact).
[112] COM(2025) 555 final, Article 26.

3.2 What impact would the Wind Fund have?

This section assesses the expected impacts of a dedicated Wind Fund against a baseline scenario without further policy change. The assessment focuses on the impacts directly linked to the problems identified in Section 2.3 and to the objectives and design of the Wind Fund set out in Section 3.1. In particular, it examines whether the Wind Fund could strengthen the EU wind sector's scientific and technological position, improve competitiveness and industrial capacity, and increase the sector's contribution to broader energy and climate objectives.

The assessment is structured around the three key objectives of the Wind Fund, as detailed in Figure 3-2. First, **scientific-technological** impacts are assessed because the Wind Fund is intended to strengthen the full innovation chain, from research to demonstration, scale-up, and industrial application. Second, **economic** impacts are assessed because a central purpose of the intervention is to improve competitiveness, reinforce the European manufacturing base, mobilise investment, and increase the economic value created in the EU. Third, **societal** impacts are assessed because stronger wind deployment and industrial capacity are expected to contribute to wider EU policy objectives, notably energy system resilience, security of supply, and progress towards climate and energy targets. Together, these three dimensions capture the main pathways through which the Wind Fund is expected to generate added value at EU level.

Figure 3-2 Impact assessment structure



3.2.1 Baseline and Wind Fund scenario assumptions

Table 3-3 summarises the key baseline and Wind Fund scenario indicators and assumptions used throughout the impact assessment. It brings together the main quantitative parameters relevant for the analysis, including current wind deployment in the EU, projected deployment trajectories, manufacturing capacity benchmarks and the scale of funding available under the baseline and WindEurope proposal for the Wind Fund.

The **Wind Fund scenario sets deployment rates that achieve modelled and policy wind capacity targets**; specifically, that onshore wind capacity (which does not have a policy target) meets the ENTSO 2024 Ten Year Network Development Plan (TYNDP) levels of over 800 GW,[113] and that offshore wind capacity, split between fixed-bottom and floating, reaches the 300 GW target first established by the EU's Offshore Energy Strategy,[114] and confirmed by the Esbjerg, Ostende and Hamburg declarations. Reaching these targets involves annual deployment rates increasing from historic levels of 15 GW of onshore wind and 3 GW of offshore wind to 30 GW and 21 GW (half of which is floating wind) by 2050, respectively. This scenario is compared against a baseline in which roughly 2/3 of the target capacity of the Wind Fund scenario is deployed.

The annual deployment rates for the **baseline scenario assume that historic deployment rates continue through 2030 and then increase linearly through 2040** as permitting and market reform take place and the existing sector makes incremental growth, reaching deployment rates of 20 GW and 13 GW (5 GW of which is floating) by 2050. These deployment levels represent a modest improvement over the 22 GW / year that Wind Europe expects the industry to be able to achieve throughout the rest of the 2020s[115], reflecting increased funding and market demand even in the absence of a Wind Fund.

These indicators provide a common reference framework for assessing the potential impacts of the Wind Fund across the economic, scientific-technological and societal dimensions of the wind sector.

Table 3-3 Baseline and Wind Fund deployment scenario (all values in GW)

Indicator	Baseline	Wind Fund	Comparison
Installed wind capacity in EU-27, 2025	246.0	246.0	
Total installed wind capacity, 2030	**331.5**	**341.0**	**+9.5**
Of which onshore	294.5	299.5	
Of which offshore	36.5	36.5	
Of which Floating offshore wind	0.5	5.0	
Total installed wind capacity, 2040	**560.8**	**655.3**	**+94.5**
Of which onshore	465.9	521.0	
Of which offshore	77.5	97.3	
Of which floating offshore wind	17.5	37.0	
Total installed wind capacity, 2050	**867.0**	**1 123.0**	**+256.1**
Of which onshore	664.5	812.0	
Of which offshore	145.0	196.5	
Of which floating offshore wind	58.5	114.5	

[113] ENTSO-E and ENTSOG (2024) TYNDP 2024 Final Scenario Report
[114] European Commission (2020) An EU Strategy to harness the potential of offshore renewable energy for a climate neutral future
[115] WindEurope (2026) Wind energy in Europe: 2025 Statistics and the outlook for 2026-2030

Note: Installed capacity in 2025 derived from WindEurope (2026); installed capacity for future years based on scenario assumptions, TYNDP 2024 and offshore wind targets.

Compared with the baseline, the proposed Wind Fund would increase the scale and strategic focus of public support for the European wind sector over 2028–2034. **Under the baseline**, total wind-relevant public funding is estimated at around EUR 3.4 billion over the period, equivalent to roughly EUR 0.5 billion per year and reflecting current EU and national public funding levels. **Under the Wind Fund scenario**, this rises to EUR 11.6 billion, or around EUR 1.6 billion per year. In other words, the Wind Fund would more than triple the level of public support available to the sector. This increase is not only quantitative but also qualitative. Whereas baseline support remains fragmented across existing EU and national instruments and is spread across a broad set of objectives, the Wind Fund would provide a dedicated, multi-annual and wind-specific framework capable of giving the sector greater visibility, continuity and strategic direction.

In addition, the **Wind Fund is assumed to mobilise at least an equivalent amount of private investment**, bringing total wind energy R&I and competitiveness investment to up to EUR 23.2 billion over 2028–2034. This reflects a conservative 1:1 public–private leverage assumption, recognising that leverage for individual programmes is typically lower for research-stage support but increases significantly at higher technology readiness levels (TRLs), particularly for industrial scale-up and commercial deployment. Evidence from Horizon Europe shows average leverage of around 1:2,[116] while instruments focused on deployment and scale-up, such as InvestEU, achieve leverage ratios in excess of 10:1.[117] In the 2021-2024 period, the actual leverage in the sector was rather 1:3 public–private.[118] Therefore, considering historical leverage ratios, the leverage ratio of individual funding programmes and that unsupported private investments which do not rely on funding also take place, the 1:1 leverage ratio used to estimate the Wind Funds economic impacts is conservative.

The main **difference between the two scenarios** lies in the composition of spending, in particular the balance between deployment and scale-up. Under the baseline, funding is concentrated on deployment (EUR 2.1 billion), with relatively limited support for research and scale-up (around EUR 0.6 billion each). This results in a weak funding profile for demonstration, first industrial applications and manufacturing scale-up, where innovation risks remain high and private investment is constrained. By contrast, the Wind Fund scenario shifts the focus towards these stages, allocating (as per WindEurope's estimates presented in section 3.1.4) EUR 2.1 billion to research and EUR 9.0 billion to scale-up, while limiting targeted deployment support to EUR 0.5 billion. This reflects the underlying market gap: the key constraint is not deployment support, but insufficient financing to move technologies from innovation to industrialisation. The Wind Fund therefore rebalances spending towards high-TRL activities with the greatest leverage for competitiveness and industrial capacity. We assume that the increased funding magnitude and greater efficiency in the Wind Fund scenario are sufficient to increase deployment rates towards levels required to achieve 2050 deployment needs.

[116] European Commission (2025), *Interim Evaluation of Horizon Europe*, which finds that each euro of EU contribution leveraged approximately EUR 0.5 in co-investment.
[117] European Commission, InvestEU Programme factsheet, indicating mobilisation of approximately EUR 280–372 billion of investment from an EU budget guarantee of EUR 26.2 billion (leverage ratio above 10:1).
[118] ETIPWind (2025) From Innovation to Industrial Competitiveness

Table 3-4 Impact of proposed Wind Fund on total wind energy R&I and competitiveness funding

Result	Indicator	Time	Baseline	Wind Fund
EU wind-relevant funding	EUR billion	2028-2034	3.4	11.6
Of which:				
Research	EUR billion	2028-2034	0.6	2.1
Scale up	EUR billion	2028-2034	0.6	9.0
Deployment	EUR billion	2028-2034	2.1	0.5
Total private funding	EUR billion	2028-2034	Not modelled	=>11.6
Total investment	EUR billion	2028-2034	=>3.4	=>23.2

Impact on speed of EU wind energy R&I funding

This section assesses whether a dedicated Wind Fund could improve the speed, flexibility, and administrative efficiency of EU wind R&I funding relative to the baseline.

As a benchmark, this section draws on the Impact Assessment for the ECF,[119] which compares three relevant administrative set-ups for future EU funding. Option A (baseline) reflects the current funding landscape, in which applicants must navigate multiple programmes with separate rules, procedures, and timelines. Option B assumes enhanced coordination between existing programmes through a common rulebook. Option C assumes fuller consolidation within the ECF, with a more integrated framework and simpler access arrangements. These benchmarks are relevant because **a dedicated Wind Fund would sit within that broader ECF architecture and would therefore be expected to benefit from similar, or potentially greater, reductions in administrative burden and processing time.** Table 3-5 summarises the indicative effects of these different set-ups on the speed and burden of EU funding in the next ECF. These statistics are provided by the ECF Impact Assessment.[120]

Table 3-5 Impact on speed and administrative burden of EU wind energy R&I funding

Aspect	Baseline (Option A)	Enhanced coordination (ECF Option B)	Full consolidation (ECF Option C)	Likely implication for a dedicated Wind Fund
Time-to-inform	86–130 days	5–10 days faster	10–15 days faster	At least in line with Option C / potentially faster for wind-specific calls
Time-to-grant	Up to 313 days; 240 days on average	5–10 days faster	10–15 days faster	At least in line with Option C / potentially faster where procedures are standardised
Proposal preparation cost	EUR 5 000–32 000	Around 5% lower	Around 10% lower, to EUR 4 500–28 800	Likely lower than baseline and potentially below the generic ECF average for repeat wind applicants
Administrative burden	High, due to fragmented rules, entry points, and timelines	Moderately reduced through a common rulebook	Reduced further through a single framework	Reduced further by a narrower sectoral scope and clearer intervention logic

The administrative improvements of the three options translate also into scientific output. When it comes to the time-to-inform and time-to grant, the gains of Option B and C are modest, and they represent marginal gains that on their own would not materially change the research cycle or the volume of patents and publications generated within a given MFF period. The ECF is a horizontal

[119] European Commission, Commission Staff Working Document, Impact Assessment Report on the European Competitiveness Fund, accompanying the proposal for a Regulation of the European Parliament and of the Council on establishing the European Competitiveness Fund, SWD(2025) 555 final.
[120] European Commission, Commission Staff Working Document, Impact Assessment Report on the European Competitiveness Fund, accompanying the proposal for a Regulation of the European Parliament and of the Council on establishing the European Competitiveness Fund, SWD(2025) 555 final.

instrument covering multiple strategic sectors and its efficiency gains are constrained accordingly. Common rulebooks and integrated frameworks can only have limited impacts when the underlying calls, evaluation panels and eligibility criteria still need to serve a broad range of technologies and applicants. On the contrary, a wind-specific fund would have a narrower and more stable applicant base, which means evaluation can be faster and more consistent. Clearer eligibility rules can reduce the back-and-forth that inflates time-to-grant in general-purpose instruments and the ability to programme calls directly against the ETIPWind SRIA means that funding reaches the most scientifically relevant priorities without the lag inherent in cross-sectoral programming cycles.

A dedicated Wind Fund could therefore perform better than the generic ECF consolidation case, even if this study does not quantify any additional reduction beyond the ECF benchmarks. More broadly, the speed and accessibility of funding is a structural feature that shapes what the Wind Fund can actually deliver. More specifically, a system that reaches researchers and industrial partners faster, with lower entry costs and more predictable programming, creates the conditions for sustained innovation activity across the full MFF period. The gains will compound over time with more projects active earlier, more continuity across TRL and a stronger pipeline of results feeding into the EU's scientific and industrial base.

3.2.2 Scientific-Technological impact

EU scientific and technological leadership in wind energy

This section assesses how a dedicated Wind Fund would affect the European scientific and technological trajectory compared with no further policy change under the baseline. The assessment considers the EU's ability to generate innovative projects and to translate research into industrially relevant applications. In this sense, the section looks at scientific leadership in terms of publications and patents (inventions) as well as at the strength of the wider innovation ecosystem, including collaboration between academia and industry and the support for early-stage innovative projects.

Current evidence shows that the EU remains highly competitive in wind knowledge creation. It ranks second globally in the number of articles and highly cited publications, behind China, and it continues to lead in high-value patents in wind energy. [121] Nevertheless, scientific leadership also depends on the ability to sustain a pipeline of innovation and to connect research actors with industrial players capable of bringing new technologies to market.

The scientific leadership impact is assessed through the indicators:

- Number of inventions: patent families represent all relevant documents related to a specific invention, such as applications filed with multiple authorities
- Number of peer-reviewed articles
- Number of collaborative projects between academia and industry
- Number of early-stage innovative projects.

These indicators provide a broader picture of scientific and technological performance. Patents and publications capture knowledge creation and protection of innovation. Collaborative projects reflect the extent to which research excellence is linked to industrial application. Early-stage innovative projects indicate the capacity of the system to generate new concepts and maintain a pipeline of high-risk, high-potential technologies.

Baseline scenario results

The baseline projections for inventions and peer-reviewed articles are based on past development rates. In principle, continued funding at current levels could sustain some growth in scientific output above historic rates, considering administrative improvements in Horizon Europe for example. However, the scientific metrics are projected on a historic trend basis since there is limited evidence

[121] *JRC (2025)* Wind Energy in the European Union *Status Report on Technology Development, Trends, Value Chains and Markets*

to suggest that maintaining current funding levels could significantly increase scientific output compared to what is recorded in the past. Therefore, the historic trend represents a lower bound for the baseline, and the Wind Fund scenario uplift should be understood as the effect of both additional resources and a structurally better funding system.

Under the baseline scenario, the EU is expected to maintain a strong position in wind science and innovation, but with increasing competitive pressure from China and other global players.

Number of inventions

Innovation activity would continue under the baseline, but at a pace broadly reflecting past trends. Considering the past development rate, which is approximately 700 patents per year[122], it is expected that under the baseline scenario the cumulative number of inventions will reach around 4 200 by 2030 and 7 000 by 2034. While this points to continued technological development, innovation efforts may remain concentrated on incremental improvements instead of more systemic breakthroughs in areas such as floating wind, digitalisation, recyclability, advanced materials and grid integration. Many of these areas are closely linked to manufacturing and post-commissioning stages and therefore require strong involvement from OEMs, operators and other industrial actors, which existing support schemes do not always incentivise sufficiently.

Peer-reviewed articles

Under the baseline scenario, peer-reviewed publication output would continue to grow, allowing the EU to remain an important actor in wind knowledge creation. Considering the past development rate of approximately 600 peer-reviewed papers per year in the EU[123], the cumulative number of peer-reviewed articles is expected to reach around 2 700 by 2030 and 6 150 by 2034. However, without dedicated support, this progress is likely to remain broadly in line with current trends and may not be sufficient to secure stronger leadership in next-generation wind technologies.

Collaboration between academia and industry

The baseline would also imply continued fragmentation across the innovation ecosystem. Collaboration between academia and industry would continue through existing programmes but would remain relatively uneven and project-based instead of strategic and continuous. This would limit the development of more structured cooperation between universities, OEMs, component suppliers, developers and test facilities, and reduce the number of projects that combine scientific excellence with clear industrial exploitation pathways.

Early-stage innovation

Similarly, early-stage innovation would continue under the baseline through the existing support schemes (e.g. Horizon Europe), but with limited support for high-risk projects and insufficient continuity along the innovation chain, i.e. from low to higher TRL. As a result, fewer innovative concepts would enter the project pipeline, and the link between early-stage research, demonstration and industrial uptake would remain weaker than needed.

Wind Fund scenario results

Peer-reviewed articles

Under the Wind Fund scenario, scientific output is expected to improve relative to the baseline, as the Wind Fund would provide a larger and more visible source of dedicated support for wind-related R&I. It will support a broader pipeline of projects across the sector's strategic priorities and therefore would help generate more research activity and hence more peer-reviewed publications. At the same

[122] *JRC (2025)* Wind Energy in the European Union *Status Report on Technology Development, Trends, Value Chains and Markets*

[123] *JRC (2025)* Wind Energy in the European Union *Status Report on Technology Development, Trends, Value Chains and Markets*

time, its stronger sector focus would improve the strategic relevance of this output by concentrating support on areas that are directly linked to Europe's long-term wind technology needs.

Number of inventions

The Wind Fund would also be expected to strengthen technological output and increase the potential for patentable results. This effect would come from higher funding levels, as well as from the Wind Fund's design, which would support the full innovation chain from research to scale-up and targeted deployment. In particular, its stronger emphasis on applied research, industrial validation and pre-commercial activities would help generate inventions with clearer industrial relevance and stronger commercial potential, including in areas where innovation depends on close involvement of OEMs, manufacturers and operators

Collaboration between academia and industry

A dedicated Wind Fund would be expected to strengthen collaboration across the innovation ecosystem. By creating a more structured and continuous framework for wind-specific projects, it would make it easier to bring together universities, OEMs, component suppliers, developers, operators and test facilities around shared priorities. This would likely increase the number of collaborative projects and co-publications, while also improving their quality and industrial relevance. Compared with the baseline, cooperation would be less fragmented and less dependent on isolated project opportunities.

Early-stage innovation

The Wind Fund would also strengthen the pipeline of early-stage innovation. Dedicated support for wind would make it possible to back a larger number of high-risk, high-potential projects, including in emerging areas such as floating systems, recyclable materials, advanced components and digital tools. The Wind Fund's continuity across the innovation chain would improve the chances that promising early-stage ideas can progress towards demonstration, scale-up and eventual market uptake. This addresses one of the main weaknesses of the baseline, where support remains more fragmented between TRL and across instruments.

Conclusions

The assessment of the scientific and technological impacts of a Wind Fund indicates that under the baseline the European wind sector would remain an important global centre for innovation. However, while Europe could maintain current levels of publication and invention, it would face an important risk of being superseded by China as the leading economy for wind R&I. Some improvements in scientific productivity and innovation could be achieved with e.g. marginal improvements the next Horizon Europe by reducing the time-to-grant, time-to-inform and general administrative burden, but likely not sufficiently to address this risk.

A Wind Fund, in contrast, could support significant growth in scientific output above historical levels, resulting in a greater number of peer-reviewed articles, invention, collaborative projects and overall increased research activity across strategic wind technology domains. Targeted funding would bolster technological innovation, leading to more patentable inventions with clearer industrial relevance and enhanced commercial potential, and dedicated support for early-stage innovation would enable a broader pipeline of high-risk, high-potential projects, improving the progression from research to demonstration and market uptake.

Table 3-6 Impact summary: EU scientific and technological leadership

Indicator [Unit]	Timing	Baseline	Wind Fund
Number of peer-reviewed articles [-/+]	Up to 2030	**+** continued growth in line with current trends	**++** moderate increase relative to baseline
	Up to 2034 and beyond	**+** continued growth, but increasing risk of losing ground in strategic technologies	**+++** stronger increase, with better positioning in strategic research areas
Number of inventions [-/+]	Up to 2030	**+** continued growth in line with current trends	**++** moderate increase relative to baseline
	Up to 2034 and beyond	**+** continued growth, but limited progress in high-value and commercially relevant innovation	**+++** stronger increase, especially in high-value and applied innovation.
Number of collaborative projects between academia and industry [-/+]	Up to 2030	**0** limited increase	**++** clear increase
	Up to 2034 and beyond	**0** collaboration remains fragmented and project-based	**++** more structured and sustained collaboration across the value chain
Number of early stage projects (innovative) [-/+]	Up to 2030	**0** limited increase	**++** clear increase
	Up to 2034 and beyond	**0** pipeline remains constrained	**++** stronger project pipeline and better continuity towards demonstration and market uptake
Overall [-/+]	**Up to 2030**	**0/+**	**++**
	Up to 2034	**0/+**	**++/+++**

3.2.3 Economic impact

Economic impacts encompass in the context of EU R&I policy generating innovation-based growth, creating more and better jobs, and leveraging investment in R&I. The high-level takeaway is that the increase in manufacturing production, induced economic activity, and avoided costs due to greater cost reductions achieved by an EUR 11.6 billion Wind Fund could contribute up to EUR 75 billion of value to the EU economy annually in the 2030s, indicating that each Euro of public funding returns around EUR 7 per year. These benefits are primarily attributed to the increased manufacturing capacity, demonstrating the importance of strengthening the competitiveness of the European wind sector through the implementation of the Wind Fund. The following impact pathways have been determined as most relevant to the proposed Wind Fund and are assessed in this section.

EU wind industry global competitiveness

Wind energy already contributes around EUR 54.5 billion to European GDP[124]. While this represents a relatively small share of the continent's EUR 15 trillion economy, the wind sector is a strategic priority for EU objectives on decarbonisation, competitiveness, and technological leadership[125]. We focus on the EU's ability to maintain and strengthen its domestic manufacturing base, supply a high share of annual wind installations through EU manufacturers and reduce dependence on non-EU suppliers in key parts of the value chain.

This is particularly relevant in a context where the EU still has a strong industrial position in wind, but where that position is increasingly challenged by rising global competition and structural bottlenecks affecting the European supply chain.

In this section, we define the following competitiveness indicators used to assess the potential impact of different funding scenarios:

[124] ETIPWind (2025) European Wind Energy Competitiveness Report.
[125] European Commission (2024) The Draghi Report on European Competitiveness.

- Production value: The total monetary value of wind energy components and equipment manufactured by the EU, including exports and components manufactured by EU firms in facilities outside of Europe. Reported in EUR billion and as a percent increase from current levels.
- Domestic value added: The share of the value of annual installed capacity produced within the EU. Calculated as domestic production value (excluding exports) divided by the annual value of installed capacity.
- Import / export value: The monetary value of wind components and equipment imported into or exported from the EU (EUR billion).
- Global market share: The share of EU production value relative to the monetary value of wind deployment in the global market. We also provide qualitative discussion of the non-EU, non-China market.

Together, these indicators provide insight into the growth potential of the EU wind manufacturing sector that could be unlocked by a Wind Fund. We estimate historic import, export, and production values using WindEurope (2026)[126] and ETIPWind (2025)[127] data for installed capacity, investment intensity, and trade. Global market value estimates rely on IRENA's Future of Wind 2050 scenarios[128]. Future technology costs are derived by applying learning curves to current investment intensities, without regional cost differentiation.

Baseline scenario results

The **baseline scenario** reflects the chronic underinvestment in the sector relative to global competitors, which is a key challenge for the European wind industry. Low public spending and difficulty attracting private investment for demonstration, scaling, and deployment constrain sector growth. Without additional support, this lack of investment could limit deployment or increase import dependency.

This **exposes the EU to external dependencies in parts of the supply chain**, especially where production is more globally concentrated or where scaling up domestic supply is more difficult. These constraints are particularly relevant in strategic areas such as next-generation turbines and system integration, digitalisation and monitoring, sustainability and circularity, and parts of floating wind industrialisation. These areas depend on final assembly capacity and on access to advanced materials, specialised sub-components, digital systems, circular processing solutions and industrial know-how. Under the baseline, support would remain fragmented across instruments and would not be sufficiently targeted at strengthening these upstream parts of the value chain. As a result, the EU may continue assembling and installing a large share of turbines domestically, while remaining dependent on non-EU inputs in several strategic segments.

In the baseline scenario, we assume increased deployment driven by improved permitting and compliance with Member States NECP targets. However, we hold EU production value constant at today's levels (around EUR 33 billion, based on ETIPWind (2025))[129].

- *Production value and domestic value added:* The value of annual installations grows from EUR 31.6 billion in 2030 to EUR 79.1 billion in 2050. These investments generate increasing local economic benefits, as described later. However, deployment levels remain only moderately above current trends (e.g., onshore wind peaks at 20 GW/year in 2040, only 5 GW above 2020–2024 averages). We assess this demand as insufficient to trigger major manufacturing expansion, so production value remains fixed at EUR 33.6 billion.

[126] WindEurope (2025) Wind Energy in Europe: 2025 Statistics and the Outlook for 2026–2030.
[127] ETIPWind (2025) European Wind Energy Competitiveness Report.
[128] IRENA (2019) Future of Wind: Deployment, Investment, Technology, Grid Integration and Socio-economic Aspects.

[129] ETIPWind (2025) European Wind Energy Competitiveness Report.

- *Domestic value added* declines sharply as a result, from 92.3% today to 36.8% in 2050. In effect, the EU continues to deploy slightly more wind capacity but becomes increasingly unable to supply its own market, let alone export to others.

- *Import / export value:* We assume EU exports continue at roughly historic levels of EUR 4.5 billion[130], reflecting a greater share of the expanding global market being met by competitors. With EUR 33.6 billion in domestic production, EUR 29.1 billion remains for the internal market. Because installation value rises significantly over time, the EU becomes increasingly reliant on imports, which grow from EUR 2.4 billion in 2030 to EUR 50.0 billion in 2050—an order-of-magnitude increase over today.

- *Global market share:* IRENA projects global deployment of around 200 GW/year of onshore wind and over 40 GW/year of offshore wind after 2040, corresponding to global market values of roughly EUR 225 billion and EUR 120 billion, respectively. With EU production fixed at EUR 33.6 billion, global market share falls from 10.9% in 2030 to just 8.3% by 2040–2050. Removing the largely self-contained Chinese market (projected to be 50% of the global market through 2030[131]) approximately doubles the global market share.

Wind Fund scenario results

In the **Wind Fund scenario**, we assume wind deployment will be accelerated through faster technology demonstration, improved designs addressing environmental and stakeholder concerns, lower costs, and higher market value. Additionally, dedicated funding to scale EU manufacturing (particularly for innovative technologies supporting floating wind and export to new markets) would enable increases in production value through new public and private investment in manufacturing capacity, de-risking first industrial applications, and improvements to port, logistics and installation readiness.

The **Wind Fund's main added value** would be its ability to support the full chain from research to industrial scale-up and targeted deployment, while focusing specifically on the strategic needs of the wind sector. In that sense, the Wind Fund would help EU firms supply more of the final installations placed on the European market and help ensure that a larger share of the value embedded in those installations is created within Europe.

As we describe in Section 3.2.1, an overarching assumption is that the Wind Fund scenario raises deployment relative to the baseline (655 GW and 561 GW, respectively, in 2040) and allows EU production to grow proportionately. Specific contributions from the Wind Fund that would directly impact EU competitiveness indicators, referring to the list of activities in Table 3-1 include:

- *Scale-up existing manufacturing capacity.* Expanding existing manufacturing capacity, building new supply chain assets, and introducing production efficiencies will enable technology providers to scale their operations to keep pace with increasing EU and global demand for components. We assume that the Wind Fund scenario directly and indirectly supports investment in the EU wind manufacturing sector, enabling it to grow at the same rate as deployment and to maintain a consistent domestic value add of around 90%.

- *Support serial manufacturing lines [for floating wind] and co-finance port upgrades for floating assembly*. Investment in enabling infrastructure will allow commercially viable installation schedules for floating wind and increased export of design-for manufacturing concepts and technologies. We assume that this enables deployment of around 10 GW of floating wind per year by the 2040s (up from 4 GW in the baseline) and a near quadrupling of the floating wind value sector from EUR 8 billion in 2030 to EUR 30.6 billion in 2040.

[130] Ibid.
[131] GWEC (2025) Global Wind Report 2025.

- *De-risk first commercial floating arrays*. Government support for early-stage projects will accelerate cost reductions through faster learning-by-doing (more efficient designs, optimised logistics, better understanding of failures and OPEX) and increased investor confidence. We assume that this contribution results in a higher floating wind learning rate (9% relative to 7% in the baseline scenario) and improved financing (7.1% nominal after-tax cost of capital relative to 7.8% in the baseline scenario) in 2040[132].
- *Support rare-earth elements substitution and magnet recycling*. Alternatives to externally sourced rare-earth magnets can substantially improve the EU's security of energy supply. Because derisking these critical supply chains would likely lower risk premiums, the resulting impact on Levelised Cost of Electricity (LCoE) would come mainly through a reduced cost of capital. The Wind Fund scenario would likely benefit from more favourable financing terms than the baseline if rare earth-free technologies reduce supply chain risk. As a result, the modelled Wind Fund impacts presented here are conservative, since they do not include any potential reduction in the cost of capital stemming from improved security of supply.
- *Support innovative installation vessels and methods and establish European Wind Skills Platform*. Expanded and innovative installation methods will be required to enable building offshore wind at scale while also meeting EU regulations on environmental permitting, marine ecosystem health, and biodiversity. Expanding the EU wind manufacturing sector will require a trained workforce with expertise in automation, robotics, AI, new materials, recycling, etc. Taken together, the Wind Fund can alleviate manufacturing and installation bottlenecks that will otherwise develop. We assess this by increasing the permissible annual installed capacity from 28 GW / year for onshore, fixed-bottom, and floating wind (baseline scenario) to over 40 GW / year (Wind Fund scenario) in 2040.
- *Advance R&I and commercialisation of next generation wind technologies.* The Wind Fund will enable the EU to patent and develop critical technologies that can serve both the domestic and export markets, particularly floating wind and HVDC technologies. We assume a 1.7:1 export: import ratio in the Fund scenario to reflect the strong global demand for advanced EU products and services, around 25% greater than the historic levels closer used in the baseline scenario.

These contributions from the Wind Fund have the following effects on key economic competitiveness impact indicators:

- *Production value and domestic value added:* We assume that domestic value added remains constant at today's levels of just under 90% even as deployment increases; this implies that the EU manufacturing sector grows significantly due to direct investment from the Wind Fund and leveraged private funding. As a result, production value rises from EUR 33.6 billion today to EUR 42.8 billion in 2030, EUR 101.5 billion in 2040, and EUR 130.3 billion in 2050.
- *Import / export value:* Imports remain similar in absolute value to the baseline—around EUR 12 billion by 2040–2050—but represent only ~10% of the total market value. With the prescribed export/import ratio of 1.7, the EU could export around EUR 22 billion annually between 2040 and 2050.
- *Global market share:* Global deployment remains unchanged relative to the baseline. The increased EU production value raises EU market share to around one-third of the global market by 2040 (and over two-thirds when removing the Chinese market).

Conclusions

The EU's binding decarbonisation targets require accelerated wind deployment. Without a dedicated Wind Fund, EU manufacturing competitiveness - both in scale and in global demand for innovative technology - may not keep pace. A Wind Fund could potentially triple the size of the EU wind

[132] NREL (National Laboratory of the Rockies). 2024. 2024 Annual Technology Baseline.

manufacturing sector by 2040, creating a EUR 100 billion industry that strengthens domestic supply while expanding EU presence in export markets.

This represents the difference between the EU being restricted as a minor global player (<10% market share) and having the potential to becoming a major supplier and technological leader (>30% market share). Excluding China's largely self-contained market, this share would roughly double. This increasing market share indicates the magnitude of the potential missed opportunity if EU competitiveness does not increase to participate in a growing global industry. The increase in production value from EUR 33.6 billion (baseline) to EUR 101.5 billion (Wind Fund scenario, 2040) represents an EUR 67.9 billion increase to the EU economy in the year 2040, which we attribute to the increased emphasis on EU competitiveness and manufacturing driven by the Wind Fund. A summary of the impact metrics is provided in Table 3-7.

Table 3-7 Impact summary: EU competitive position in global and domestic markets

Indicator [unit]	Timing	Baseline	Wind Fund	Comparison
Manufacturing sector: Production value [EUR billion]	Up to 2030	33.6 (2030)	42.8 (2030)	+9.2
	Up to 2034 and beyond	33.6 (2040) 33.6 (2050)	101.5 (2040) 130.3 (2050)	+67.9 +96.7
Manufacturing sector: Production value [% increase from current levels]	Up to 2030	N/A	27 (2030)	+27
	Up to 2034 and beyond	N/A	202 (2040) 288 (2050)	+202 +288
Manufacturing sector: Domestic value added share [% relative to installed capacity]	Up to 2030	92.3 (2030)	89.4 (2030)	-2.9
	Up to 2034 and beyond	47.1 (2040) 36.8 (2050)	89.4 (2040) 89.4 (2050)	+42.3 +52.6
Trade value: import value [EUR Billion]	Up to 2030	2.4 (2030)	4.2 (2030)	+1.8
	Up to 2034 and beyond	32.7 (2040) 50.0 (2050)	10.0 (2040) 12.8 (2050)	-22.7 -37.1
Trade value: export value [EUR Billion]	Up to 2030	4.5 (2030)	7.2 (2030)	+2.7
	Up to 2034 and beyond	4.5 (2040) 4.5 (2050)	17.1 (2040) 22.0 (2050)	+12.6 +17.5
Market share: of global production value [%]	Up to 2030	10.9 (2030)	14.0 (2030)	+3.1
	Up to 2034 and beyond	8.3 (2040) 8.3 (2050)	29.6 (2040) 36.8 (2050)	+21.3 +28.4
Overall	**Up to 2030**	**0**	**+**	
	Up to 2034 and beyond	**-**	**++**	

EU wind industry socio-economic contributions

Wind deployment drives substantial socio-economic benefits through job creation, gross value added (GVA), reinvested economic activity, and revenues across onshore, offshore, and floating technologies. These impacts scale with deployment volume and technology mix and therefore differ significantly between the Baseline and Wind Fund scenarios. In this section we highlight socio-economic indicators that quantify these effects:

- *Total jobs (direct and indirect):* Employment created in manufacturing, construction, and operations across wind technologies. Reported as total jobs per year.

- *Gross value added (GVA):* Cumulative economic value created across supply chains and operations. Reported in EUR billion per year averaged over each decade.
- *Technology investment cost trajectories:* Capital cost trends (EUR million / MW) for onshore, offshore, and floating wind, reflecting technology maturity and learning.
- *Sectoral revenues:* Annual market revenues associated with generation across technologies (real EUR 2025).
- *Reinvested economic activity:* The portion of revenue reinvested into the EU economy, including supply chains and service sectors.

These indicators collectively illustrate how a Wind Fund would not only support competitiveness but also expand economic welfare and improve other socio-economic indicators across the EU. We apply historic workforce and GVA data to future deployment trajectories to estimate the jobs and economic contribution of future capacity installations. We use wind-specific CAPEX learning rates for future cost trajectories ranging from business-as-usual to advanced industry maturation. Based on future cost and technology assumptions, we calculate the LCoE for representative wind projects in 2030, 2040, and 2050 and use this to estimate the net revenue from installed capacity in each year. Using a historical relationship between wind revenues and induced economic activity, we calculate the economic contribution to the broader EU economy from future wind deployment.

Future employment projections are derived from historical wind sector data reported by WindEurope[133] and ETIP Wind[134], which estimate the EU wind industry workforce at 442 800 and 362 844, respectively. WindEurope data is used to establish an upper-bound jobs-per-MW factor for manufacturing, construction, and operations across all technologies. A lower-bound estimate is derived by applying the ratio between ETIP Wind and WindEurope workforce figures as a scaling factor.

This lower bound is applied to all job estimates in the 2040 and 2050 baseline scenarios to reflect anticipated increases in automation and production efficiency. For the Wind Fund scenario, the lower bound is applied to operations and indirect jobs in 2040 and 2050, while the upper-bound jobs-per-MW factor is retained for manufacturing and construction to capture the policy objective of strengthening domestic manufacturing capacity. All 2030 job estimates are based on the upper-bound WindEurope factors.

These projections are subject to significant uncertainty due to discrepancies in current workforce estimates and unclear future growth trajectories. Key challenges include workforce development under uncertain deployment timelines, competition from imports, and the increasing role of automation and artificial intelligence in wind energy systems. Accordingly, results should be interpreted carefully, though they indicate substantial potential for sustained employment growth in the EU wind sector.

We model the effects that cost trajectories have on project revenues but do not consider how this may impact deployment. In reality, deployment rates could be reduced by more expensive (and therefore less competitive) wind projects or by reaching saturation points where marginal wind capacity has low market value. This analysis is outside the scope of this study; we assume that wind is deployed at the targeted rate, and then evaluate the impact of the competing effects of higher cost / lower deployment (baseline scenario) and lower cost / higher deployment (Wind Fund scenario) on socio-economic indicators.

Baseline scenario results

In the baseline scenario, we assume that EU deployment increases moderately from current levels with some modest evolution in cost and performance through learning-by-doing. As a result,

[133] WindEurope (2026). Wind energy in Europe: 2025 Statistics and the outlook for 2026-2030.
[134] ETIPWind (2025). European Wind Energy Competetiveness Report.

socio-economic outcomes grow, but not proportionately to the scale needed for achieving EU climate and industrial goals.

This scenario highlights the same problems as the competitiveness evaluation in the previous section – wind R&I is underfunded and is not well suited to bringing innovations to market or to accelerating learning rates through increased demonstrations and scale-up support. Costs decrease over time driven by business-as-usual learning rates. We calculate CAPEX reductions from today's levels using learning curves, and prescribe OPEX and net capacity factor improvements based on current values and modelled future trajectories. Key assumptions include:

- CAPEX learning rates: 7% [135,136]
- Cost and performance improvements by 2050[137]:
  - OPEX: 12% decrease from today's levels
  - Capacity factor: 5% increase from today's levels
- Job intensity[138]:
  - Manufacturing: 2 938 jobs / GW (onshore), 2 983 jobs / GW (offshore)
  - Construction (including planning, transport, installation, and grid connections): 3 136 jobs / GW (onshore), 4 006 jobs / GW (offshore)
  - Operations: 93 jobs / GW (onshore), 191 jobs / GW (offshore)
  - Indirect: 539 jobs / GW (onshore), 908 jobs / GW (offshore)
- Reinvested economic activity: EUR 237 per EUR 1 000 of revenue[139].

These assumptions yield the following impacts from the baseline scenario:

- *Jobs:* Total direct and indirect wind jobs increase from ~419 000 in 2030 to 855 000 in 2050. These jobs include contributions from the manufacturing, construction, and operations sectors. Floating wind contributes an increasing share of jobs after 2040 but still remains a smaller share overall.
- *Gross value added:* Wind deployment contributes around EUR 90 billion per year in the 2030s, increasing to EUR 120 billion per year in the 2040s.
- *Technology investment costs:* Capital costs fall gradually for onshore and offshore wind, reaching investment costs of EUR 1.3 million / MW and EUR 3.4 million / MW by 2050, respectively. Floating wind achieves a more precipitous decline as it progresses from pre-commercial to commercial markets, eventually reaching EUR 5.4 million / MW.
- *Revenue:* Based on cost and performance trajectories, the LCOE of wind projects decreases from EUR 46 / MWh to EUR 31 / MWh (onshore) and EUR 122 / MWh to EUR 102 / MWh (fixed bottom offshore) by 2050. This LCOE is equal to the revenue requirement that achieves a zero net present value for a representative project; therefore, the total revenue accrued by installed capacity grows from EUR 60 billion in 2030 to EUR 152 billion in 2050 – even though projects installed in 2050 are cheaper than those built in 2030, the increased capacity leads to increased revenue from the sector.

135 Bollinger, Wiser, and O'Shaunessy (2022). Levelized cost-based learning analysis of utility-scale wind and solar in the United States
136 NLR (National Laboratory of the Rockies). 2024. 2024 Annual Technology Baseline.
137 Ibid
138 WindEurope (2025) Wind Energy in Europe: 2025 Statistics and the Outlook for 2026–2030.
139 ETIPWind (2025) European Wind Energy Competitiveness Report.

- *Reinvested economic activity:* Based on the revenue modelled above and the estimates of reinvested economic activity from ETIPWind, reinvestment rises modestly from EUR 14.1 billion in 2030 to EUR 36.0 billion in 2050.

Wind Fund scenario results

In the Wind Fund scenario, we assume that increased R&I investment leads to accelerated cost reduction and increased levels of deployment, amplified by dedicated scale-up and competitiveness funds, more demonstration projects, and applied research into decreased operational costs and performance improvements. Specific contributions from the Wind Fund that would directly impact EU socio-economic indicators include:

- *Accelerate cost reductions through investments in enabling infrastructure and demonstration projects.* Industrial scale-up, growth in manufacturing capacity, and investment in enabling infrastructure are key drivers of wind cost reductions. We evaluate the impact of the Wind Fund by introducing higher learning rates for the capital costs of onshore, offshore, and floating offshore wind, as described in the previous section. These increasing learning rates result in capital costs that are 5-10% lower than the baseline scenario in 2040.

- *Improve project performance through advanced R&I.* Research into the operation of onshore and offshore wind farms can reduce OPEX and net capacity factors through innovations such as advanced turbine system designs, novel materials, improved forecasting, better controllers, predictive maintenance, digital twins-based monitoring, and smart system integration. We assume that the Wind Fund results in a greater reduction in OPEX relative to the baseline (15% and 12% decrease from today's levels by 2050, respectively) and an increase in capacity factor (10% and 5% increase from today's levels by 2050, respectively).

Taken together, these effects of the Wind Fund result in a LCOE around 10% lower than the baseline scenario in 2050, which can increase the economic viability of wind projects and the subsequent likelihood of being deployed. Job intensities and reinvested economic activity are unchanged from the baseline scenario; considering potential productivity gains or increased levels of automation from the Wind Fund is outside of the scope of this study. The increased deployment levels drive greater socio-economic benefits across all of the impact metrics.

- *Jobs:* Total direct and indirect wind jobs increase to over 1.2 million in 2050, leading to a workforce around 30% larger than the baseline scenario by mid-century. Employment expands in all categories (manufacturing, construction, O&M), and floating wind becomes a significant job creator as capacity accelerates after 2040.

- *Gross value added:* Cumulative GVA rises sharply, reaching over EUR 123 billion per year in the 2030s and over EUR 182 billion per year in the 2040s, 50% higher than the baseline levels.

- *Technology investment costs:* Capital costs fall more rapidly for all technologies, reaching investment costs of EUR 1.2 million / MW (onshore wind), EUR 3.0 million / MW (fixed bottom offshore wind), and EUR 5.2 million / MW (floating offshore wind) by 2050. These increased cost savings represent an avoided cost of around EUR 2 billion per year in the 2030s and EUR 3.3 billion per year in the 2040s relative to an equivalent deployed capacity at the cost levels from the Baseline scenario.

- *Revenue:* Total revenues grow from EUR 70 billion (2030) to around EUR 200 billion (2050), an increase of around 30% relative to the Baseline scenario in 2050. Offshore and floating wind become major revenue engines as technology scales and costs fall. LCOE of floating offshore wind drops below that of fixed-bottom offshore wind in the early 2040s.

- *Reinvested economic activity:* Reinvestment rises from EUR 16.6 billion in 2030 to EUR 46.5 billion in 2050, roughly a 30% increase over the baseline scenario.

Conclusions

The socio-economic impact analysis underscores the transformative potential of a dedicated Wind Fund. While the Baseline scenario delivers steady but modest growth, the Fund scenario unlocks a high-growth pathway in which:

- *Annual jobs exceed 1.2 million by 2050 (vs. 855 000 in Baseline).*
- *Cumulative GVA between 2040 - 2050 surpasses EUR 1.8 trillion (vs. EUR 1.2 trillion in the Baseline)*
- *Reinvested economic activity is nearly 30% higher than Baseline.*
- *Revenue growth and cost reductions both accelerate dramatically, driven by expanded offshore and floating wind.*

The difference between scenarios represents the difference between an EU wind sector that keeps pace with global growth versus one that leads it—supporting industrial competitiveness, regional employment, supply-chain resilience, and high-value economic activity. A summary of these socio-economic impacts is presented in Table 3-8.

Table 3-8 Impact summary: EU wind industry socio-economic contributions

Indicator [unit]	Timing	Baseline	Wind Fund	Comparison
Direct and indirect jobs [1000 jobs]	Up to 2030	4193	443	+ ~20
	Up to 2034 and beyond	575 (2040) 855 (2050)	763 (2040) 1209 (2050)	+ ~180 + ~350
Gross value added to EU economy [EUR billion per year]	Up to 2030	67.1	74.5	+7.4
	Up to 2034 and beyond	89.8 (2031-2040) 119.8 (2041 – 2050)	123.1 (2031-2040) 182.9 (2041-2050)	+33.2 +63.1
Revenue [EUR billion]	Up to 2030	59.4	70.1	+10.7
	Up to 2034 and beyond	99.0 (2040) 152.0 (2050)	117.5 (2040) 196.4 (2050)	+18.6 +44.4
Economic activity generated [EUR billion]	Up to 2030	14.1	16.6	+2.5
	Up to 2034 and beyond	23.5 (2040) 36.0 (2050)	27.9 (2040) 46.5 (2050)	+4.4 +10.5
Investment cost [EUR million / MW]	Up to 2030	Onshore: 1.4 Fixed-bottom: 3.8 Floating: 8.6	Onshore: 1.4 Fixed-bottom: 3.8 Floating: 8.0	Onshore: 0 Fixed-bottom: 0 Floating: -0.6
	Up to 2034 and beyond	Onshore: 1.3 (2040) 1.3 (2050)	Onshore: 1.3 (2040) 1.2 (2050)	Onshore: 0 (2040) -0.1 (2050)
		Fixed-bottom: 3.6 (2040) 3.4 (2050)	Fixed-bottom: 3.3 (2040) 3.0 (2050)	Fixed-bottom: -0.3 (2040) -0.4 (2050)
		Floating: 6.1 (2040) 5.4 (2050)	Floating: 6.1 (2040) 5.2 (2050)	Floating: 0 (2040) -0.2 (2050)
Overall	**Up to 2030**	**0**	**+**	
	Up to 2034 and beyond	**+**	**++**	

3.2.4 Societal impact

Societal impacts encompass in the context of EU R&I policy addressing EU policy priorities and global challenges through R&I, delivering societal benefits and impacts through R&I missions, and strengthening the uptake of R&I in society.

In this section, societal impacts are assessed in terms of how increased wind deployment and the resulting renewable electricity generation contribute to broader EU policy objectives, in particular energy system resilience and security of supply, and progress towards climate and energy targets.

The analysis focuses on the downstream effects of deployment, including increased domestic energy supply, reduced reliance on fossil fuels, and lower GHG emissions.

The following impact pathways have been determined as most relevant and are assessed in this section.

EU energy system resilience and security of supply

Energy system resilience and security of supply are central to EU objectives on decarbonisation, competitiveness and strategic autonomy. Wind energy already plays a key role in the EU electricity system, and its further expansion is expected to contribute not only to emissions reduction, but also to reducing dependence on imported fossil fuels and strengthening the robustness of the energy system. In this context, additional support under the Wind Fund should be understood not only in terms of increasing renewable electricity generation, but also in terms of reinforcing the EU's capacity to deliver generation through its domestic industrial and service base.

In this section, resilience is assessed along two complementary dimensions. First, the contribution of wind energy to increasing **domestically generated renewable electricity and diversifying the electricity mix**. Second, the extent to which wind deployment and operation can be sustained over time without significant reliance on external suppliers. In this respect, the **availability of sufficient domestic manufacturing, infrastructure and operational capacity** is important for ensuring the reliable delivery and operation of wind assets. Together, these dimensions determine the extent to which the EU energy system is exposed to external supply risks, both in terms of energy carriers and industrial value chains.

To assess these impacts, the following indicators are considered:

- Installed wind capacity and annual installations, as a measure of the scale and pace of deployment;
- Renewable electricity generation from new installations, as a proxy for increased domestic energy supply;
- Domestic manufacturing capacity and production value (as presented in section 3.2.3);
- Domestic value added share of installed capacity (as presented in section 3.2.3);
- Import dependency for wind components and related infrastructure.
- Imported natural gas displaced by wind-based electricity generation

Together, these indicators provide a comprehensive view of how wind deployment and the associated industrial ecosystem contribute to energy system resilience and security of supply. Evidence from the economic impact assessment (section 3.2.3) is used to assess how changes in domestic manufacturing capacity, value added and import dependency influence the resilience of the wind energy system.

Baseline scenario results

Under the baseline scenario, wind energy deployment in the EU continues to increase but remains below the trajectory required to meet climate, resilience, and energy objectives.

Installed capacity, annual installations and renewable generation: Installed wind capacity rises from around 246 GW in 2025 to 331.5 GW by 2030 (560.8 GW by 2040 and 867.0 GW by 2050). Between 2031 and 2040, this implies average annual additions of around 23.0 GW. At an assumed average capacity factor in 2040 of 34% for onshore wind and 51% for offshore wind in 2030, these annual additions would generate approximately 94.3 TWh of renewable electricity per year once operational.[140]

This contributes to strengthening energy system resilience through increased domestic renewable electricity generation and a more diversified electricity mix. However, these improvements are constrained by developments in the underlying industrial and supply-chain base.

[140] Estimated based on installed wind capacity increasing from 246 GW in 2025 to 331.5 GW in 2030, implying average annual additions of around 17.1 GW over 2026–2030. Electricity generation is calculated using 8 760 operating hours per year and a 40 per cent average capacity factor for new wind installations, resulting in approximately 59.9 TWh per year once operational.

Domestic manufacturing capacity, production value and share of installed capacity: As shown in the economic impact assessment (3.2.3), domestic supply capability weakens under the baseline. We assume EU production value remains broadly constant at around EUR 33.6 billion, while the share of domestic value added declines from 92.3% in 2030 to 47.1% in 2040 and 36.8% in 2050. This indicates increasing reliance on imported equipment, components and associated services to enable modest growth in deployment rates, which in turn increases exposure to external supply disruptions.

Import dependency increases correspondingly, with imports rising from EUR 2.4 billion in 2030 to EUR 32.7 billion in 2040 and EUR 50.0 billion in 2050. This trend indicates that a growing share of the goods and services required to deploy and maintain wind capacity is sourced from outside the EU.

In parallel, limited expansion of EU-based port infrastructure, installation vessels and servicing capacity may constrain the pace and reliability of deployment, particularly for offshore and floating wind. This may also affect the robustness of long-term operation and maintenance.

Overall, while the baseline scenario leads to an increase in wind-based electricity generation, the resilience benefits remain limited. The energy system relies to a greater extent on external industrial capacity and supply chains for the equipment, infrastructure and services required to support wind deployment, as well as continued import of fossil fuels due to slower substitution by renewable electricity.

Wind Fund scenario results

Under the Wind Fund scenario, higher wind deployment leads to greater renewable electricity generation and reduced reliance on fossil-fuelled power generation. At the same time, the scenario assumes a stronger domestic industrial and service base sufficient to support the delivery and operation of this higher level of deployment. Together, these effects improve energy system resilience and security of supply.

Installed capacity, annual installations and renewable generation: Under the wind fund scenario, wind deployment increases more rapidly than under the baseline, although the effect remains relatively limited by 2030 because the Wind Fund would only begin operating in 2027 and its impacts on innovation, manufacturing scale-up and project delivery would materialise progressively. Installed wind capacity rises from around 246 GW in 2025 to 341.0 GW by 2030 and 655.3 GW by 2040. Between 2031 and 2040, this implies average annual additions of around 31.4 GW.[141] At an assumed average capacity factor of 34% for onshore wind and 52% for offshore wind in 2040[142], these annual additions would generate approximately 144.7 TWh of renewable electricity per year once operational.[143] This is around 50 TWh more in 2040 compared to the baseline and is equivalent to roughly 3% of projected EU-27 gross electricity generation.[144] This additional domestic renewable generation would, over time, help reduce reliance on fossil-fuelled electricity, particularly natural gas, and lower exposure to external price volatility.

This additional domestic renewable generation would also, under the illustrative assumption that wind-based electricity generation displaces natural gas-fired generation, increase the equivalent volume of imported natural gas displaced by wind-based electricity generation, from more than 330 bcm/year(y) in the 2040 baseline to more than 400 bcm/y in 2040, thereby further reducing exposure to imported fossil fuels and external price volatility.[145]

[141] Calculated from installed wind capacity increasing from 341.0 GW in 2030 to 655.3 GW in 2040, implying average annual additions of around 31.4 GW over 2031–2040.
[142] Using the same capacity factor assumptions from Section 3.2.3.
[143] The additional renewable electricity generation relative to the baseline is estimated at approximately 29.5 TWh per year in 2040, calculated as the difference between 110.1 TWh under the Wind Fund scenario and 80.6 TWh under the baseline.
[144] Calculated on the basis of annual renewable electricity generation from new installations under the Wind Fund scenario of 150.7 TWh in 2040. Using projected EU-27 gross electricity generation of around 5 212 TWh in the EU Reference Scenario, or around 5 183 TWh in ENTSO-E's Ten-Year Network Development Plan, the wind electricity share corresponds to 2.9%.
[145] Estimated using a simplified gas-displacement sensitivity, based on total annual wind electricity generation of around 1 800 TWh/year in the 2040 baseline and 2 100 TWh/year in the 2040 Wind Fund scenario, and a

Domestic manufacturing capacity, production value and share of installed capacity: As presented in Section 3.2.3, the Fund scenario is also associated with a stronger domestic supply base for wind deployment and operation. EU production value increases to EUR 42.8 billion in 2030 and to EUR 101.5 billion in 2040, reflecting significant expansion of manufacturing capacity. Domestic value added remains at around 89% across the period, indicating that the large majority of the value of installed capacity continues to be generated within the EU. Import dependency is correspondingly reduced, with imports remaining significantly below baseline levels (EUR 4.2 billion in 2030).

This stronger domestic supply base improves the availability of manufacturing, infrastructure and operational services needed to deploy and maintain wind assets, thereby reducing dependence on external providers and improving the reliability and continuity of operation. As a result, the EU is better able to deploy and operate wind assets using its own industrial and service capabilities, reducing exposure to external supply disruptions and improving operational reliability.

Conclusion

The Fund scenario would accelerate wind deployment and increase domestically generated renewable electricity, reducing reliance on imported fossil fuels and diversifying the EU electricity mix. It would also reduce exposure to external supply-chain dependencies associated with the delivery and operation of wind assets. Together, these effects would enhance EU energy system resilience and security of supply.

Table 3-9 Impact summary: Improved energy security and resilience of EU wind industry

Indicator [Unit]	Timing	Baseline	Wind Fund	Comparison
Installed wind capacity [GW]	Up to 2030	331.5	341.0	+9.5
	Up to 2040	560.8	655.3	+94.5
	Up to 2050	867.0	1123.0	+256.1
Average annual wind installations [GW/y]	Up to 2030	17.1	19.0	+1.9
	Up to 2040	22.9	31.4	+8.5
	Up to 2050	30.6	46.8	+16.2
Renewable energy generation from annual installations [TWh/y]	Up to 2030	54.0	60.9	+6.8
	Up to 2040	94.3	144.7	+50.4
	Up to 2050	120.5	196.6	+76.1
Total annual wind electricity generation [TWh/y]	Up to 2030	1 013	1 048	+34.1
	Up to 2040	1 806.6	2 146.6	+339.9
	Up to 2050	2 948	4 080	+1 132
Share of EU electricity supply [%]	Up to 2040	>30%	>40%	~+10%
	Up to 2050	>40%	>60%	~+20%
Equivalent imported natural gas displaced [bcm/y]	Up to 2040	>330	>400	+70
	Up to 2050	>540	>750	+210
Improved EU energy system resilience and security of supply (-/+)	Up to 2030	-	+	
	Up to 2040	-	++	
	Up to 2050	-	++	
Overall impact [-/+]	**Up to 2030**	**0**	**+**	
	Up to 2040 and beyond	**0**	**++**	

conversion factor of 5.4 TWh of electricity per bcm of natural gas. On this basis, wind generation displaces around 335 bcm/y in the baseline and 403 bcm/y in the Wind Fund scenario.

Wind energy contribution to EU climate and energy targets

Wind energy plays a central role in the EU's decarbonisation pathway, both by increasing the share of renewable energy in the electricity mix and by reducing GHG emissions through the displacement of fossil-fuelled generation.

The assessment focuses on two dimensions:

- The contribution of wind deployment to the EU renewable energy targets;
- The avoided GHG emissions in the power sector.

The analysis uses installed wind capacity, renewable electricity generation from annual installations, and avoided GHG emissions ($MtCO_2e$/year) as key indicators. It builds on the deployment scenarios presented in the previous section and assesses alignment with EU 2030 targets under a baseline scenario and a Wind Fund scenario. Avoided emissions are estimated using a gas-displacement approach, whereby additional wind generation is assumed to replace fossil-fuelled electricity generation using a standard emissions factor per unit of electricity generated.

The **impact pathway** assessed is as follows: higher wind deployment leads to additional renewable electricity generation, which increases the renewable share in electricity supply and reduces fossil-fuelled generation, thereby improving progress towards EU climate and energy targets.

Baseline results

Under the same baseline deployment trajectory as discussed in the previous section (3.2.3), wind energy continues to make a significant contribution to EU renewable electricity supply. However, deployment remains below the level required to remain on track with EU climate and energy objectives. In particular the gap between projected capacity in 2030 (331.5 GW) and the estimated level required to support the renewable energy target (around 425 GW) indicates that wind deployment remains insufficient under the baseline.

Using a simplified natural-gas displacement approach, this additional annual renewable generation corresponds to around 20.5 $MtCO_2e$ of avoided emissions per year in 2030 and 35.8 $MtCO_2e$ in 2040. While this represents a meaningful contribution to emissions reduction in the power sector, it is not sufficient to fully align the electricity system with EU climate and energy objectives.[146]

Wind Fund results

Under the Wind Fund scenario, installed wind capacity rises from around 246 GW in 2025 to 341 GW by 2030 and 655.3 GW by 2040. This corresponds to average annual installations of around 19 GW over 2026–2030 and around 31.4 GW over 2031–2040.[147] As the Wind Fund would only begin operating in 2027, and its effects on innovation, manufacturing scale-up and project delivery would materialise progressively, the difference relative to the baseline remains limited by 2030, but becomes much larger thereafter.

At this level of deployment, the Wind Fund adds 60.9 TWh/y of renewable generation in 2030 and 144.7 TWh/y in 2040. This is around 7 TWh/y more than under the baseline in 2030 and around 50 TWh/y more in 2040, reflecting both higher annual installations and faster scale-up.

Under the same natural-gas displacement sensitivity, this corresponds to around 23 $MtCO_2e$/y of avoided emissions annually in 2030 and around 55 $MtCO_2e$/y in 2040. Relative to the baseline, the Wind Fund would therefore deliver around 2.6 $MtCO_2e$ of additional avoided emissions per year by 2030. By 2040, this additional effect rises to around 20 $MtCO_2e$ per year.

[146] Calculated using a simplified natural gas-displacement factor of 0.38 $kgCO_2e$/kWh. On this basis, 54.0 TWh of additional annual renewable generation corresponds to 20.5 $MtCO_2e$/year in 2030, while 94.3 TWh corresponds to 35.8 $MtCO_2e$/year in 2040. This is a simplified proxy for avoided power-sector emissions and does not capture changes over time in the carbon intensity of the electricity mix or in the marginal generation source displaced.
[147] Average annual additions are derived from the change in installed capacity over each period: (341.0 – 246.0) GW over 2026–2030 = 19.0 GW/year, and (655.3 – 341.0) GW over 2031–2040 = 31.4 GW/year.

Separately, looking at the full installed fleet rather than only the incremental effect, total annual wind generation reaches around 1 800 TWh/year in the 2040 baseline and around **2 100 TWh/year under the Wind Fund scenario**. This corresponds to 300 TWh/year of additional wind generation in 2040 under the Wind Fund scenario.

Conclusions

The Wind Fund scenario would strengthen the contribution of wind energy to EU climate and energy objectives by enabling higher levels of deployment and renewable electricity generation. This would significantly support progress towards the EU renewable energy target for 2030, with almost an additional 100 GW in installed capacity by 2040, and contribute to additional reductions in GHG emissions from the power sector. Over the longer term, this accelerated deployment trajectory is consistent with the direction of travel in the TYNDP 2024 long-term scenarios, in particular Distributed Energy and Global Ambition, which are designed to reach climate neutrality by 2050.

Table 3-10 Impact summary: Improved contribution to EU climate and energy targets

Indicator [unit]	Timing	Baseline	Wind Fund	Comparison
Total annual wind electricity generation [TWh/y]	Up to 2030	1 013	1 048	+34.1
	Up to 2040	1 806.6	2 146.6	+339.9
	Up to 2050	2 948	4 080	+1 132
Avoided GHG emissions from total wind generation [$MtCO_2e/y$]	Up to 2040	686.5	815.7	+129.2
	Up to 2050	1 120.3	1 550.6	+430.3
Overall impact [-/+]	**Up to 2030**	**0/+**	**+**	
Overall impact [-/+]	**Up to 2040 and beyond**	**0/+**	**++**	

3.3 Summary of Impact Assessment

Table 3-11 presents selected main benefits of the Wind Fund compared with the baseline by 2040 and the wind sector today. The impact assessment of a Wind Fund performs better than the baseline across all impact dimensions. Its main added value lies in strengthening the parts of the innovation chain that are weakest under the baseline, in particular demonstration, product development, and commercialisation. This leads to a more competitive and resilient industrial base, higher economic value creation in the EU, enhanced energy security and open strategic autonomy, stronger scientific and technological outcomes, and a larger contribution to climate objectives.

As presented in the preceding sections, the gains are more limited by 2030, as the next MFF and the Wind Fund would only begin in 2028 and would take time to become fully operational. Thereafter, the effects become much more significant as innovation, manufacturing capacity, and deployment scale up. Beyond 2030, the Wind Fund would provide a stronger basis for EU leadership in wind energy, higher value creation in Europe, and a more resilient and decarbonised energy system.

Realising the full benefits would nevertheless depend on complementary action beyond the Wind Fund itself and thus outside of the scope of this study, in particular on stable, predictable support for wind deployment at national level, as well as measures related to permitting and infrastructure planning.

Table 3-11 Selected main impact indicators for the baseline and Wind Fund scenario

	EU wind sector today	Baseline scenario	Wind Fund scenario	Comparison
	2025 unless indicated	2040	2040	2040
INDUSTRIAL AND ECONOMIC CONTRIBUTIONS				
Average gross value added [EUR billion / year]	**59**	90⁺	**123⁺**	**+33⁺**
Jobs supported*	**338 000**[148,±]	>580 000	**>760 000**	**+180 000**
Wind equipment export value [EUR billion / year]	**5.3**	4.5	**17.1**	**+12.6**
Global market share of production	**~21%**[149,±]	8.3%	**29.6%**	**3.5x**
ENERGY SECURITY & OPEN STRATEGIC AUTONOMY CONTRIBUTIONS				
Share of EU electricity supply	**~19%**	>30%	**>40%**	**+10%**
Equivalent imported natural gas displaced [bcm / year]	**>85** (850 LNG shipments)[#]	>330	**>400**	**+70** (700 LNG shipments)[#]
Cumulative installed wind energy capacity [GW]	**246**[148]	561	**655**	**+94**
Annual electricity production [TWh / year]	**465**[148]	≥ 1800	**≥ 2 100**	**+300**
EU sourced equipment & services	**92.3%**	47.1%	**89.4%**	**1.9x**
SCIENTIFIC & TECHNOLOGICAL CONTRIBUTIONS				
Patents and publications	**700 patents, 600 peer-reviewed articles** Leading in high-value patents and second in publications[149]	Moderate growth but **losing ground** to competing economies	**Strong increase with better positioning** in strategic areas, high-value and applied innovation	
CLIMATE CONTRIBUTIONS				
Avoided emissions through natural gas substitution [$MtCO_2$ / year]	**142**[150,±] (>4% of total EU emissions)	>680*	**>800**	**+120** (>10% of gross EU emissions)[151]

Own calculations based on study assumptions except where indicated

⁺ *Average over 2031-2040 decade*

± *2024 value*

[148] WindEurope (2026) Wind Energy in Europe - 2025 Statistics and the outlook for 2026-2030

[149] JRC (2025) Clean energy technology observatory: Wind energy in the European Union - 2025 status report on technology development, trends, value chains and markets

[150] ETIPWind (2025) European Wind energy competitiveness report

[151] Assuming projected EU gross greenhouse gas emissions of 850 $MtCO_2$-eq in 2040, consistent with the European Commission (2024) Securing our future Europe's 2040 climate target and path to climate neutrality by 2050 building a sustainable, just and prosperous society COM/2024/63 final. The >680 and >800 $MtCO_2$ figures are 2040 scenario estimates based on total annual wind generation from the cumulative installed fleet. The ">10%" comparison refers to projected gross EU emissions in 2040.Assuming EU gross GHG emissions of 850 $MtCO_2$-eq in 2040 to achieve the 2040 EU climate target

4 Wind Fund implementation

Key points

- **The Wind Fund will be built on 8 design principles**. These will enable the Fund to respond to emerging challenges in the sector, ensure industry relevance while maintaining a balanced TRL distribution of funding, address system integration considerations relevant to wind, adhere to EU regulations and the funding ecosystem, and align with necessary legal compliance and data confidentiality requirements.

- The governance of the Wind Fund will be based on established good practice of EU partnerships. A **Governing Board** with representatives from high-level EC, industry C-suite and research organisations leaders to ensure balance, relevance to the industry and coherence with EU policies and programmes. This will be supported by the **Executive management** and a **technical committee** to ensure execution based on competencies and sector insight.

- The Wind Fund's operational model will build on a **Strategic Roadmap**. The roadmap will be based on the SET Plan organisations in wind to ensure the broadest stakeholder alignment while maintaining the ability to prioritise strategically and enabling operational coordination with other EU and national programmes.

- The Strategic Roadmap will be implemented through an **annual work programme**. The work programme will be based on clear and harmonised selection criteria and two-stage calls for high-risk proposals will reduce efforts spent on proposals.

- The Wind Fund will support a **small number of Centres of Competence** to provide shared state-of-the-art testing infrastructure and knowledge platforms. These will be established as funded consortia of existing research institutions and commercial test facilities with a mandate to serve the wider sector.

- The Wind Fund will **make full use of the ECF's available financial instruments**. The instruments will be tailored to each phase of innovation, aligned with the fund's 8 design principles. The instruments will be implemented using in-kind contributions and milestone-based payments. A flexibility reserve will be set aside to address urgent technology needs to be implemented through fast-track windows.

4.1 Introduction

This chapter expands on details for governance, operational management and implementation arrangements for the European Fund for Wind Research & Competitiveness. The previous chapters have established the necessity for a dedicated EU-level instrument and shown the positive impact it could have. This chapter outlines how such a fund would be structured to operate effectively in practice.

The Wind Fund is a response to a set of six interconnected structural and operational problems, which motivate the specifics of the Wind Fund's design (see Chapter 2 for their full elaboration):

1. **Fragmentation across EU and national support:** Wind R&I support is spread across many EU and national programmes, each with different rules, timelines and requirements. This creates unnecessary complexity for applicants and makes it difficult to build a coherent funding pathway from research to demonstration, scale-up and industrial deployment.
2. **Weak support for higher TRLs, demonstration and manufacturing scale-up:** the most acute financing gaps in the EU wind sector are concentrated at TRL 5–9, covering prototype validation, demonstration, early industrial application and manufacturing scale-up. These

stages are too risky for commercial finance, but existing EU instruments also do not adequately cover them, leaving a financing gap.

3. **Lack of continuity between strategic priorities, calls and funded projects:** The wind sector's long-term competitiveness depends on a sustained, strategic programme of R&I investment. Yet the existing funding architecture is characterised by discontinuity, with launched calls not always linked to previous results or to a common long-term strategy, thereby weakening continuity across the innovation chain.

4. **Excessive complexity and slow processes in existing instruments:** Current EU funding processes are too slow and burdensome, especially for industrial actors and SMEs. Long time-to-grant periods and multiple administrative systems reduce accessibility and delay projects' support.

5. **Insufficient alignment between public funding requirements and industry needs:** Public programmes tend to focus on scientific and easily measurable outputs, such as publications or inventions. However, industry needs support that helps bring technologies to market, strengthen supply chains and reduce investment risk, which current programmes do not always capture well.

6. **Weak mechanisms to connect wind R&I with broader energy system priorities:** The value of wind energy to the European energy system depends on its integration with grid infrastructure, storage, digital monitoring systems, sector coupling and broader system integration mechanisms. Existing support has not consistently addressed these broader system-level needs, limiting the contribution of wind innovation to the wider energy transition.

From these problems we define eight design principles for the Wind Fund. These principles underpin the specific features outlined in the following sections, and should be reflected in the Wind Fund's founding documents, call templates, and governance procedures.

1. **Flexibility & responsiveness:** the Wind Fund should provide flexibility in funding and operations to be able to respond to urgent needs or energy technology opportunities in the wind sector, while maintaining compliance, transparency, accountability and traceability of the funds spent at the governance level.

2. **Industry relevance:** Industry should be actively involved in all aspects of the Wind Fund and the Wind Fund should also encourage private investment in innovation.

3. **TRL balance:** the Wind Fund's portfolio must span the full innovation chain, from early-stage research through demonstration to manufacturing scale-up, supporting progress to market maturity. It should build on a strong foundation, which has been built over decades, and maintain this innovation pipeline without losing focus on addressing the two valleys of death.

4. **Simplicity and administrative proportionality:** the Wind Fund must deliver a step-change or significant reduction in administrative burden relative to existing instruments.

5. **Coherence with EU regulatory and funding ecosystem:** the Wind Fund should be designed in a way that allows, where appropriate, the combination of EU and national support under a clear, synergistic and legally workable framework.

6. **EU added value and complementarity with national programmes:** the Wind Fund should add value across the EU and above and beyond what Member States and existing EU instruments can provide through strategic alignment and synergies.

7. **System integration considerations:** (e.g. grid readiness, resilience, digitalisation, sustainability, circularity) should be embedded as standard in the Wind Fund. A system integration approach is important to ensure cost reductions, value capture, security and sustainability.

8. **Legal compliance, knowledge sharing and confidentiality:** the Wind Fund should operate under clear rules on State aid, competition, Intellectual Property (IP), confidentiality and data-sharing, ensuring legal certainty for participants while protecting commercially sensitive information and enabling appropriate knowledge sharing

4.2 Proposed governance arrangements for the Wind Fund

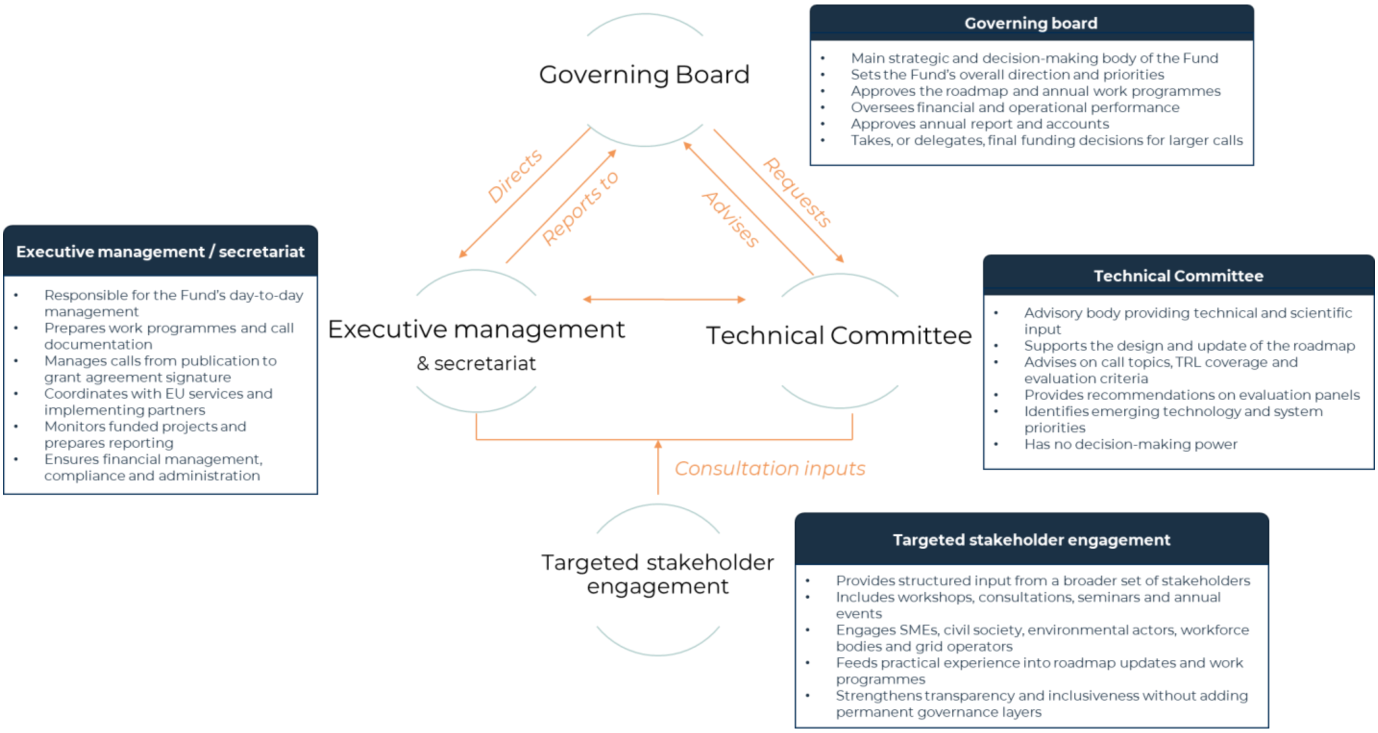
The governance arrangements of the Wind Fund should reflect the operational requirements of the Wind Fund (see also 4.3) and the political constraints of a multi-stakeholder body operating within the EU regulatory framework. It needs to ensure flexibility and responsiveness, be relevant for industry, coherent with EU and national policies and programmes and balance governance systems against administrative simplicity and proportionality.

It is noted that the MFF proposal places strong emphasis on simpler access and more coherent implementation, this is an important principle taken into account in the proposed arrangements. [152]

4.2.1 Governance bodies, mandates, and decision rights

Based on established good practice in EU partnership governance, such as the Clean Hydrogen partnership, we propose a structure that is lean and functional. The proposed model is built around a limited number of bodies with clearly differentiated strategic, executive and technical roles, in order to support efficient decision-making, avoid overlaps and conflicts of interest and keep organisational costs proportionate to the Wind Fund's scale and objectives. The aim is to ensure that administrative expenditure remains limited and predictable, with annual administrative resources defined in the founding documents and monitored over time. At the same time, it provides for transparent and traceable decision-making, as well as balanced representation across public authorities, industry and the research community. Figure 4-1 provides an overview of the proposed governance bodies and their interactions.

Figure 4-1 Proposed EU Fund for wind research and competitiveness organogram



[152] European Commission (n.d.) The 2028-2034 EU budget for a stronger Europe

Governing Board

The Governing Board is the Wind Fund's primary strategic and decision-making body. It is responsible for setting strategic direction, approving the roadmap and annual work programmes and providing oversight of the Wind Fund's financial and operational performance.

The Governing Board will comprise i) high-level representatives at Director level of the European Commission (e.g. DG RTD, DG ENER, and DG GROW, or equivalent successor directorates), ii) C-level representatives from the wind industry, including OEMs, component suppliers, and project developers, with provisions to ensure that SMEs are well represented and are not structurally disadvantaged relative to large OEMs, and iii) leadership representation from the research community, including universities, research institutes, and test facilities. The representatives from industry and research communities will be selected from WindEurope and ETIPWind. The latter includes the representation of EERA JP Wind. This aims to ensure industry relevance and coherence with EU policies and programmes including the SETPlan community. The precise number of seats and the allocation between stakeholder categories will be defined in the terms of reference, with a view to ensuring no single category holds a blocking minority. The number of seats will be limited to ensure effective governance.

The responsibilities of the Governing Board include:

- Adopting the Roadmap (see section 4.3.1);
- Approving annual work programmes and ring-fenced budget envelopes by TRL band and roadmap's priority;
- Setting the KPI framework and monitoring targets (see also 4.3.4);
- Overseeing the performance of the Executive management;
- Approving the Wind Fund's annual report and accounts;
- Approve final project selection decisions for calls above a defined financial threshold.

Executive management

The Executive management comprises an Executive Director and a small secretariat, responsible for the Wind Fund's daily operations. The Executive Director is appointed by and accountable to the Governing Board.

The secretariat's functions include:

- Preparation of annual work programmes and call documentation, in consultation with the Technical Committee;
- Management of call procedures, from publication to grant agreement signature;
- Coordination with EU services (e.g. DG RTD, DG ENER, CINEA) and implementing partners (e.g. EIB Group);
- Monitoring of the funded project portfolio and preparation of monitoring reports;
- Delivery of strategic documents including the Roadmap update process ;
- Financial management and compliance with ECF common rulebook requirements.

The secretariat should be staffed at a level appropriate to the Wind Fund's operational needs to maintain administrative proportionality. The staff should cover programme management, financial and legal functions, communications, and monitoring and evaluation. The staff should have dedicated expertise in the energy and manufacturing sectors to ensure that the Wind Fund's operations remain closely aligned with industrial realities and sector needs. This could be accessed through the technical committee, but it is valuable to also have these capabilities within the executive management and secretariat. The secretariat may be hosted by an existing EU implementing agency or established as a dedicated entity, a decision to be made on the basis of cost-efficiency and institutional fit.

The costs of the Executive management and secretariat should be covered through a dedicated administrative budget line separate from the Wind Fund's operational budget for grants and financial instruments. This administrative budget could be **fixed as a percentage of the operational budget (cap model).** For example, administrative expenditures for the Clean Hydrogen Partnership are capped at 3% of total administrative and operational costs.[154] The founding documents should define this cap on administrative costs, ensuring predictable financing for staffing, legal and financial support, monitoring, IT systems and coordination activities, while keeping administrative expenditure proportionate and transparent. Any unspent administrative resources could, where legally feasible, be reallocated to operational activities.

Once the administrative budget of the Wind Fund is set, there are a **number of options to fund those administrative costs:**

- **EU budget contribution (direct allocation):** The EU contributes a dedicated administrative budget line as part of the Fund's overall budget, complementary to the total or operational envelope;
- **Industry membership fees or in-kind contributions:** Private sector participants contribute (for example through WindEurope) to administrative running costs either through direct fees or in-kind (for example, seconded staff);
- **Levy on funded projects (overhead recovery):** A percentage overhead is applied to each funded project and returned to the Fund to cover central administration, applicable to all funded participants.

Technical Committee

The Technical Committee is an advisory body composed of Experts from industry, research, and wind energy system operators, it could use the ETIPWind Steering Committee as a base for its membership. It provides technical and scientific advice to the Governing Board and Executive management on:

- The content and priorities of the roadmap and its periodic update;
- Call design, including the definition of topics, TRL targets and balance, and evaluation criteria;
- The composition and instructions for evaluation panels;
- The assessment of system and technology developments and emerging priorities that may require adaptive management responses.

The Technical Committee does not have decision-making authority, but its recommendations must be formally considered by the Governing Board. This structure ensures that technical quality is maintained while preserving the Governing Board's strategic authority.

It is recommended that Industry-research co-programming committees are created for each priority domain (see section 4.3.1 for these domains). These specialist committees with industry and research representation would specialise in the specific R&I domains. However, these committees should be relatively small groups, i.e. 5-persons, to retain speed and responsiveness and to avoid over-institutionalising processes.

Stakeholder engagement mechanisms

The ECF proposal foresees the establishment of a Strategic Stakeholders Board, composed of experts appointed by the Commission and informed by an observatory on emerging technologies. Strategic guidance and stakeholder input from this Board can influence priorities, implementation choices and the shaping of ECF work programmes and investment orientations, thereby affecting

[154] See articles 76 and 77 of [Council Regulation (EU) 2021/2085 establishing the Joint Undertakings under Horizon Europe]

whether wind value-chain needs (notably demonstration and scale-up) are consistently reflected across the ECF's windows.[156]

While it remains to be seen how the proposed Strategic Stakeholders Board will be implemented in practice, it would sit at a higher level than the governance arrangements of the Wind Fund itself. Therefore, it would be the responsibility of the Wind Fund Governing Board and Executive management to discuss and align with this ECF governance layer, for example by reporting on the Wind Fund activities and contributing to discussions in convened meetings, and providing information to the technologies observatory which will support the ECF Stakeholders Board.

But in addition to the interactions with the ECF Strategic Stakeholders Board, the Wind Fund will require tailored engagement with wind sector (and wind-adjacent) stakeholders. The Wind Fund could thus benefit from specific stakeholder engagement formats, especially in the case it were to take over some of the function of ETIPWind, otherwise ETIPWind could likely provide much of the necessary input. Formats such as thematic seminars, industry workshops, annual conferences, consultation events and targeted stakeholder hearings could be used for targeted engagement. These mechanisms can provide participants with clearer value through opportunities to present experience, exchange views, build networks and react to concrete strategic or operational questions. Such formats would also allow the Wind Fund to engage a broader range of actors, including SMEs, civil society and environmental organisations, skills and workforce bodies, and grid operators, without creating additional permanent governance layers or administrative burden. Where needed, these engagement activities could feed into the preparation of the roadmap updates, annual work programmes and periodic reviews of Wind Fund performance.

4.2.2 Operational basis of the governing bodies

Draft terms of reference

The founding documents of the Wind Fund should include terms of reference for each governance body, covering the following elements:

- Overall mandate, specific objectives, scope, tasks, interaction with other bodies and decision-making procedures;
- Membership rules: accession and exit criteria, geographical balance provisions, rules for the participation of associated and non-EU countries, and the composition and appointment process for each body;
- Openness and transparency: conflict of interest architecture, including declaration requirements, screening procedures, and recusal rules; decision traceability requirements specifying how decisions are recorded and made accessible; and complaints and appeals pathways for stakeholders affected by Wind Fund decisions.

Draft code of conduct

All members of the Wind Fund's governance bodies and all members of evaluation panels will be required to sign and adhere to a code of conduct covering:

- **Independence and impartiality**: members must act in the interest of the Wind Fund's objectives rather than the interests of their employing or sponsoring organisations.
- **Transparency obligations**: members must declare all relevant interests at the time of appointment and on an ongoing basis and must recuse themselves from any decision in which they have a direct or indirect financial interest.
- **Rules for industry confidentiality**: members may be exposed to commercially sensitive information in the course of their duties. The code of conduct will define the scope of confidentiality obligations and the consequences of breach.

[156] European Commission (2025) Proposal on establishing the European Competitiveness Fund ('ECF')

- **Data-sharing and IP safeguards**: the code will specify the rules governing the handling of intellectual property disclosures, unpublished research results and other sensitive information shared within governance proceedings.

4.2.3 Governance risks and mitigation

The governance architecture described above is designed to address a set of foreseeable risks that have affected analogous EU bodies. Mitigation measures are proposed for each: in the table below.

Table 4-1 Governance risks and respective mitigation measures

Governance Risk	Mitigation Measure
Over-institutionalisation and excessive administrative overhead	✓ Lean governance design with defined personnel and cost ceilings ✓ Annual review of administrative cost ratio ✓ Preference for hosting within existing EU agency where efficient
Marginalisation of small and less-represented stakeholders (SMEs, emerging actors)	✓ Explicit SME representation requirements on the Governing Board ✓ Dedicated SME call windows and advisory support ✓ Optional Stakeholder Panels for civil society and workforce organisations
Excessive rigidity preventing adaptive management	✓ Two-stage processes and fast-track windows in annual work programmes ✓ Defined mid-cycle review ✓ Roadmap updated on rolling 3-year cycle ✓ Governing Board can reallocate up to a share of the budget between TRL bands annually
Dominance by large OEMs or large Member States	✓ Capped voting weights or consensus requirements on strategic decisions ✓ Independent chair for Governing Board ✓ Conflict of interest screening for all board members ✓ Geographical balance provisions in membership rules
Misalignment or duplication with national and / or EU instruments	✓ Strategic alignment through the Roadmap, Member State consultation and coordination with relevant EU instruments ✓ No attempt at full implementation-level alignment with national instruments ✓ Clear focus on EU added value: cross-border scale, shared infrastructure, and continuity across TRLs ✓ Optional national top-ups or coordination where feasible ✓ Coordination with existing EU instruments to ensure complementarity and avoid overlap

4.3 Operational model

The operational model of the Wind Fund is designed to respond to the six operational problems identified in section 4.1. It aims to create a more coherent funding pipeline across the full innovation chain, improve continuity between strategic priorities, calls and projects, provide greater predictability and flexibility in programming, and strengthen complementarity between EU and national funding. The following proposals for the operational model also integrate the principles listed in 4.1.

4.3.1 Strategic programming

A Strategic Roadmap

The Wind Fund's strategic programming cycle begins with a **Strategic Roadmap** that will be developed for the Wind Fund. This will be a multi-annual document that translates the sector's long-term technology and competitiveness priorities into the Wind Fund's operational framework. In this way, the Strategic Roadmap will be an important tool to increase predictability in funding opportunities.

The Roadmap would build on the existing wind strategies, such as the ETIPWind SRIA and JP Wind, and turn them into concrete funding orientations and priority areas for the Wind Fund. In this way, the Wind Fund will represent a next step in implementation from the R&I priority setting done by ETIPWind and JP Wind. The Roadmap would serve as the main reference point for annual work programme design, call architecture and budget allocation decisions for the Wind Fund.

The Roadmap should be adopted by the Governing Board and updated on a rolling multi-annual basis, with lighter bi-annual vision papers or similar updates used to capture important technological, industrial or policy developments requiring focus on R&I and innovation support, this could include updates to the broader sector SRIA by ETIPWind.

The Roadmap will be developed in consultation with the Technical Committee, the IWG Wind, and relevant European Commission services (e.g. DG RTD, DG ENER, DG GROW), ensuring alignment with both sector priorities and EU policy objectives. The technical committee, or a sub-group of it, could be appointed by the executive as lead authors of the Roadmap, and for this to be refined in discussion with the Executive and Governing Board.

The Roadmap should cover the following **priority domains** that have been developed through extensive consultation with the industry and R&I organisations. Each domain has specific technology sub-priorities, TRL targets and indicative funding orientations:

- **Next-generation turbines :** advanced turbine architectures;
- **Offshore wind digitalisation and monitoring:** digital twins, predictive maintenance, interoperable data systems, cybersecurity, and fleet-scale monitoring;
- **Sustainability and circularity:** new materials, blade recycling technologies, rare earth elements substitution, life extension, and circular value chains;
- **Skills, human capital, and education:** curricula development, training schemes, reskilling, and sector-wide workforce development platforms;
- **Floating wind industrialisation:** component validation, sustainable manufacturing processes, port and logistics readiness, and early commercial projects;
- **Installation infrastructure and cabling:** innovative installation methods, cable reliability solutions, harmonised testing platforms, and standards development.
- **Industrialisation and manufacturing scale-up:** in addition to floating wind, a broader focus on industrialising and commercialising innovative wind technologies, and scaling up capacities for their manufacture in Europe.

- **Wind energy system integration:** forecasting, storage integration, grid optimisation, hybrid projects and ancillary services

In addition, cross-cutting system integration considerations should be embedded throughout the Roadmap, including grid readiness, digitalisation, flexibility and lifecycle sustainability. This should be reflected both in the design of individual calls and in periodic cross-cutting calls on topics spanning several priority domains.

Annual work programmes and call architecture

The Roadmap will be translated into operational programming through annual work programmes, which set out the specific calls to be launched, the budget envelopes allocated to each call, the instrument types to be used and the TRL ranges targeted. Annual work programmes will be prepared by the Executive management in consultation with the Technical Committee and adopted by the Governing Board.

The architecture of the annual work programme should reflect the following structural features:

- **TRL-balanced portfolio**: ring-fenced budget envelopes for early-stage research, mid-stage innovation and late TRL industrialisation and scale-up activities, preventing systematic drift across TRL bands;
- **Industry-research co-programming committees**: specialist committees with industry and research representation advise on call design within each priority domain, ensuring calls are adjusted to actual sector needs;
- **Predictable grant criteria and two-stage calls:** clear criteria increase transparency for participants and reduce the time to grant. Two-stage calls for high-risk projects allow feedback early in the process and reduce time spent on proposals, this could be complemented by fast-track windows for urgent or emerging technology needs.
- **Harmonised evaluation criteria across instruments:** clear and coherent evaluation criteria help speed up processes for applicants and evaluators. However, some specificity and variation in criteria is necessary.
- **Predictability and advance notice**: indicative call plans covering the following two years should be published alongside each annual work programme, giving applicants sufficient time to prepare and plan partnerships.

Call frequency should be differentiated by instrument type. For example, research grants may follow annual or bi-annual schedules, while demonstration and scale-up calls may be launched on a less frequent but larger-scale basis, reflecting the longer preparation times required for capital-intensive proposals.

Ensuring coherence and continuity

Several specific mechanisms are proposed to ensure coherence and continuity, to address the identified problems in Wind R&I:

- **Centres of competence:** the Wind Fund should support the establishment or consolidation of a small number of European wind technology centres of competence, which would provide shared state-of-the-art testing infrastructure, pilot facilities, and knowledge exchange platforms. These would be funded consortia of existing research institutions and industrial test facilities, with a mandate to serve the wider sector. This would address issues highlighted in the consultation for the EU innovation Act for companies to access research and technology infrastructures[157];

- **Two-stage processes:** as noted above, two-stage processes can help to screen and tailor proposals more quickly at early stages and could be complemented by fast-track

[157] https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/14593-European-Innovation-Act/public-consultation_en

mechanisms, which provide a channel for urgent or exploratory topics that fall outside the standard call architecture;

- **Harmonised templates and criteria:** standardised call templates and evaluation criteria, applicable with appropriate modifications across all instrument types and TRL ranges, will reduce the adaptation burden on applicants and evaluators and improve the comparability of evaluation outcomes across the portfolio.

4.3.2 Funding instruments

Funding instruments and the architecture for the Wind Fund were already set out in section 3.1 , the reader is referred to these sections for detailed descriptions of the Wind Fund approach. The following Figure 4-2 summarises how different funding instruments become relevant at the different stages of development relevant for the Wind Fund. The selection of instruments is designed to provide the appropriate level of risk reduction to firms to encourage their participation in R&I. Reducing risk and securing participation is crucial to leverage private resources, know-how, capacity and investment.

Figure 4-2 Overview of funding instruments at different stages of development

Early research	Prototyping	Product Development	Commercialisation	Market Maturity
Predominantly grant-based support, justified by high technological uncertainty / too high risk for commercial finance	Continued use of grants, potentially combined with limited repayable elements where appropriate. Addresses gaps between research and commercial finance.	Increasing use of blended support combining grants with loans or guarantees. Addresses reduced bankability gaps as capital needs rise and technical risks persist	Greater use of risk-sharing instruments such as guarantees and loans, possible use of grants in case of demonstrable profitability gaps or other reasons. Crowds-in private lenders and reduces cost of capital.	Targeted use of public guarantees, concessional loans, and (quasi-)equity instruments. Focus on risk-sharing and on strengthening European-based supply chains, resilience and industrial competitiveness

Amongst the key additional specific aspects of note on funding are:

- **Financial reserve mechanism:** is proposed to set aside funding to flexibly respond to emerging needs or opportunities. In the following section a two-stage process and fast track approach is described, which would utilise this mechanism.
- **Transparent management:** of the portfolio of financial instruments will be important to reduce administrative burdens for private investments, especially from financial institutions.
- **Full use of available instruments:** the Wind Fund should utilise the full range of ECF financial instruments, adapted to each stage of innovation. Particular attention should be given to use the full revolving capacity of loan, guarantees and equity stakes [see European Commission Court of Auditors opinion 1/2026 p.14].
- **In-kind contributions:** the Wind Fund will leverage private investment, this can take many forms, not only direct financial contributions, and very often including in-kind contributions of staff time, facilities and resources. The Wind Fund will need to provide specified guidance on the extent to which in-kind contributions can be used, and how these may be proven and accounted.
- **Milestone-based payments:** are a typical mechanism used across multiple funding instruments to manage risks to the funding provider and to incentivise achievement of the R&I objectives by the participants. The Wind Fund will work with the independent

evaluation panel (see 4.3.3) and potentially Technical Committee members not involved in the funded activities to set realistic milestones for funded projects.

4.3.3 Project selection and evaluation

Call preparation

Each call will be prepared by the Executive management in consultation with the Technical Committee and aligned with the Roadmap and the annual work programme. The preparation process for each call will include:

- Publication of a call plan aligned with the Roadmap, in advance of the call opening, specifying the topics covered, the instrument types to be used, the TRL range, indicative budget, and anticipated time-to-grant;
- Consultation with the Technical Committee and Member State representatives on call design, including the formulation of evaluation criteria and the definition of eligibility conditions;
- Advance information sessions for potential applicants, including webinars and written guidance, to improve proposal quality and reduce preparation costs;
- Clear TRL-linked requirements specifying the documentation expected at each stage, proportionate to the scale and nature of the activity.

For the two-stage mechanism for breakthrough concepts, and especially fast-track calls, a simplified preparation process will apply, with a shorter advance notice period and lighter consultation requirements

Project evaluation and selection

Project evaluation will be conducted by independent expert evaluation panels, composed of individuals with relevant technical, industrial, and regulatory expertise and subject to conflict-of-interest screening. Panels will be constituted on a call-by-call basis, with membership drawn from a standing roster of qualified evaluators maintained by the Executive management.

Evaluation will apply a transparent scoring framework covering the following dimensions:

- Scientific and/or technological excellence and innovation potential;
- Industrial feasibility and pathway to application or commercialisation;
- Supply chain and manufacturing impacts, including contribution to EU value chain resilience;
- System integration: contribution to grid readiness, digitalisation, cyber-physical resilience, sustainability, or circularity objectives;
- Quality of the consortium: balance between research and industrial partners, cross-border composition, and inclusion of SMEs and scale-ups;
- Quality of the project plan: milestones, budget credibility, risk management, and dissemination or exploitation strategy.

Final selection decisions will be made by the Governing Board (or a delegated sub-committee) on the basis of the evaluation panels' ranked lists, with the possibility of reserving a proportion of each call's budget for projects that score highly on system integration or supply chain criteria as a targeted policy instrument. All selection decisions will be accompanied by written justification and published in a transparent manner.

4.3.4 Operational coordination with other programmes

The Wind Fund should aim to maximise synergies and complementarities with other EU and national programmes.

EU instruments

The Wind Fund will maintain structured relationships with the implementing bodies of key EU instruments to ensure operational coherence and avoid duplication:

- **Horizon Europe**: the Wind Fund's Executive management will maintain a regular coordination interface with the European Climate, Infrastructure and Environment Executive Agency (CINEA) to align wind-relevant calls under Horizon Europe with the Wind Fund's own programming, and to establish pathways for follow-on funding from Horizon Europe funded projects into the Wind Fund's scale-up instruments;
- **European Competitiveness Fund**: as a ring-fenced window within the ECF, the Wind Fund will operate under the ECF common rulebook and will participate in the ECF's cross-programme coordination mechanisms;
- **Innovation Fund**: coordination with CINEA should focus on complementarity as both instruments may support demonstration and manufacturing scale-up. The added value of the Wind Fund would lie in its wind-specific focus, broader instrument mix and selection criteria tailored to sector needs.
- **InvestEU / EIB Group**: the Wind Fund's financial instruments at TRL 7–9 will be implemented in partnership with the EIB Group, drawing on its existing experience with the wind sector and its capacity to structure, evaluate, and manage complex blended finance operations at scale.

Alignment with national programmes

The Wind Fund will not seek full implementation-level alignment with all Member State programmes, as the diversity of national rules, timelines and priorities makes this impractical and administratively disproportionate. Instead, alignment should be pursued primarily at the strategic level, with targeted coordination mechanisms where complementarity offers clear added value. It is also acknowledged that the volume of support the Wind Fund can provide means its priorities and work programmes will also influence national programmes.

In practice, Member State input could be supported through three main channels: first, an annual analysis by the Wind Fund's Executive management of national calls and programmes relevant to wind energy, in order to identify strategic overlaps and opportunities for complementarity. Second, direct engagement from national companies, R&I organisations and funding agencies to propose co-funding opportunities or practical alignment between EU- and nationally funded projects. Thirdly, political or strategic agenda-setting initiatives led by groups of Member States[158], where these create a basis for operational follow-up through the Wind Fund.

In that context, possible forms of coordination could include optional national top-ups to Wind Fund calls, co-funded or jointly designed calls, grant-as-a-service approaches, the use of IPCEI top-ups, where foreseen under the wider EU framework, and alignment of annual work programmes with national energy and innovation priorities, including NECPs and national R&I strategies.

Intellectual property

Intellectual property (IP) is a critical commercial concern for firms and intellectual property management is a key aspect for the Wind Fund to deal with. This will be addressed already within the code of conduct for the Wind Fund (see section 4.2.2), with the overall aim to ensure the right balance between risk and incentives for the industry and research participants, i.e. that the level of risk taken on (e.g. in providing own contributions, sharing existing IP) is also reflected in the treatment of IP generated by R&I work supported by the Wind Fund. As a general rule, the greater the publicly funded share, the more open and accessible the outputs should be, and vice-versa as industry contributions increase, so should their exclusive rights to IP.

[158] Such as the Hamburg North Sea Summit

Good IP management relies on the proper distribution and acknowledgement of the rights of the involved parties. This includes both the existing IP of consortium partners (IP background) or those that result from the project execution and that might be of exploitable interest (IP foreground). The aim is to avoid potential inconveniences, delays and conflict that may occur while using and exploiting the technology and know-how generated during the funded R&I activities.

Common practices for IP management in the EU, for example in Horizon Europe, involve clearly distinguishing between the background and foreground knowledge each participant brings or can expect to benefit from. Some form of contractual document (for example a Grant Agreement) would be used to define the terms and conditions regarding the Intellectual Property generated through activities funded by the Wind Fund.

The Wind Fund would typically adopt ownership rules aligned with the default practices in Horizon Europe, however, different arrangements could be reached contractually either prior to the funding of any activities or during/afterwards.

Data Sharing and Data Confidentiality

Operational data from wind farms (e.g. SCADA, condition monitoring, wake interactions, downtime and more) is a strategic asset for owners and operators. At the same time, real-world data sets of operational data can have immense value for all R&I by creating standardised operational reference data used for validation of software models and demonstrators.

European wind R&I - similar to other energy domains – lack the framework for establishing the reference datasets and progress on the agenda have proven difficult. As a major coordinated funding source, the Wind Fund could look into developing a consolidated and agreed framework for data sharing that ensured proper protection of commercially sensitive data.

Achieving this will require a multi-tiered approach to data sharing and confidentiality that would include considerations of IP, security and regulatory concerns, liability risks and the establishment of long-term institutional arrangements. A first step would be to develop a data framework that could be built around four principles:

- design and deploy a data platform based on the principles of Findable, Accessible, Interoperable and Reusable (FAIR) data.
- Develop a data governance and access framework
- Standardise data formats and metadata schemata
- Integrate platform into EU digital infrastructure to have a controlled data sharing model

4.3.5 Performance measurement, monitoring and evaluation

KPI framework

The Wind Fund's performance measurement framework will be structured around three tiers of indicators, reflecting different levels of attribution and time horizons:

Tier 1 – Output indicators measure the direct results of Wind Fund activities: for example, number of projects funded by TRL band, volume of private co-investment mobilised per instrument type, number of patents filed or licences granted, number of publications resulting from funded projects, time-to-grant achieved against target and number of SMEs and scale-ups supported.

Tier 2 – Outcome indicators measure the intermediate effects of Wind Fund activities on the wind sector: for example, number of technologies successfully progressing from one TRL stage to the next within the funded portfolio, increase in EU wind manufacturing capacity attributable to Wind Fund-supported scale-up activities, cost reductions in wind technology classes targeted by Wind Fund research and number of collaborative academia-industry partnerships established.

Tier 3 – Impact indicators measure the Wind Fund's contribution to broader EU objectives: for example, installed wind capacity in EU-27, EU global market share in wind manufacturing, direct and indirect employment in the wind sector, GVA contribution of the wind industry and avoided GHG emissions attributable to incremental wind deployment.

It is highly recommended that industry, via the technical committee, should have a direct involvement in shaping the evaluation and impact criteria for the Wind Fund, especially from TRL 4 and onwards. This is based on the companies' deep knowledge of the key industrial milestones in each step of the innovation cycle. This would for example reflect know-how about how wind turbine design is translated into manufacturing processes, certification and validation or the impact on the supply-chain.

Monitoring and reporting

Monitoring and reporting arrangements will comply with the requirements of the proposed ECF Regulation. In addition to these regulatory requirements, the Wind Fund will establish its own internal monitoring cycle aligned with its annual work programme rhythm.

Annual monitoring reports will be submitted to the Governing Board, covering progress against the KPI framework, financial execution rates by instrument and TRL band, status of the funded project portfolio, assessment of leverage achieved and issues or risks requiring strategic attention. These reports will be published in summary form on the Wind Fund's website, ensuring transparency to stakeholders and the wider public.

Periodic evaluation will be conducted at mid-term (for example after three years of operation) and at the end of the programme period. Mid-term evaluation findings will be used to inform adaptive management decisions, including potential reallocation of budget between TRL bands or Roadmap priority domains. End-of-period evaluation will assess the Wind Fund's overall effectiveness and provide recommendations for the design of any successor instrument.

Reporting burden on beneficiaries will be proportionate to project size and stage. Simplified reporting templates will apply to projects below a defined threshold (to be agreed in the founding documents), and milestone-based reporting will be used where feasible at higher TRL levels. The Wind Fund will invest in digital reporting tools to reduce the administrative cost of compliance for both beneficiaries and the secretariat.

4.4 Phased implementation pathway and transition from the current set-up to the Wind Fund

The creation of the Wind Fund will require a phased implementation pathway. In that respect, the experience of analogous EU structures, such as the Clean Hydrogen Joint Undertaking, shows that successful set-up depends on combining a clear legal basis, early strategic programming, transitional implementation arrangements and progressive build-up of governance and delivery capacity.

Below we propose a four-phase transition pathway.

Phase 1 – Political mandate and legal establishment

The first step is the political decision to establish the Wind Fund and define its legal basis within the future ECF architecture. At this stage, the core parameters of the Wind Fund should be fixed in the founding act or equivalent legal instrument. That includes policy objective, scope of eligible activities, indicative budget envelope, broad governance structure, relationship with the ECF common rulebook and the possibility to use both grant and financial instruments.

This phase should also clarify the Wind Fund's relationship with existing EU instruments, in particular Horizon Europe, the Innovation Fund, InvestEU and financing instruments managed by the EIB.

A key deliverable of Phase 1 should therefore be a legal and operational delimitation of roles: for example, lower-TRL collaborative research may continue to interact with Horizon-type instruments, while the Wind Fund would provide continuity into demonstration and industrial scale-up stages, and complement the Innovation Fund on first-of-a-kind commercial deployment.

Phase 2 – Preparatory set-up and transitional governance

Once the legal basis is adopted, a preparatory phase is needed before the Wind Fund can launch full calls. During this stage, the EU would establish an interim implementation structure responsible for preparing the Wind Fund's first operating cycle. This could be hosted by an existing EU body or implementing agency, depending on the final institutional model selected.

The main tasks of this preparatory phase would be:

- appointing the initial Governing Board and setting its rules of procedure
- designating the Executive Director or interim head of the secretariat
- establishing the Technical Committee and conflict-of-interest procedures
- drafting the Wind Fund's founding documents, including terms of reference and code of conduct
- developing the first Strategic Roadmap
- preparing the first annual work programme, call templates, evaluation criteria and monitoring framework
- setting up coordination arrangements with Member States and existing EU instruments

Phase 3 – Initial operationalisation and pilot implementation

Before reaching full-scale operation, the Wind Fund should pass through an initial operational phase in which a limited first wave of activities is launched. This phase would test procedures, build credibility with stakeholders and allow adjustment before larger budget envelopes are committed.

In this phase, as described in section 4.3.1, the Wind Fund's first Strategic Roadmap should be translated into an initial package of pilot activities, drawing on the existing ETIPWind SRIA as the main strategic reference, together with relevant IWG Wind implementation planning and EERA JP Wind documents. This could include a first package of pilot calls concentrated on a small number of priority areas where financing gaps are already well evidenced, such as demonstration support, floating wind industrialisation, manufacturing scale-up and cross-cutting system integration topics. During this period, the Wind Fund should also test the key procedural innovations proposed in this report, including harmonised templates, shortened time-to-grant, TRL-differentiated instruments and two-stage processes with fast-track windows.

Phase 4 – Full operational deployment

Once the pilot phase has validated the Wind Fund's procedures and governance, the Wind Fund can enter full operational deployment. At this stage, the Wind Fund could start rolling strategic programming updates, annual work programmes, differentiated call calendars by instrument type, and a full KPI and monitoring cycle.

At this point the Wind Fund should have established an identity within the EU funding landscape, as a predictable, sector-led mechanism that connects long-term wind competitiveness priorities with concrete calls and a coherent project pipeline across TRL stages.

Certain considerations should be taken into account during the transition period.

- Continuity for beneficiaries should be preserved. Therefore, the transitional arrangement should allow projects emerging from Horizon Europe, Innovation Fund or national schemes to be considered for follow-on support under the Wind Fund where relevant.
- Coordination with Member States should begin in the preparatory phase and not only once the Wind Fund is operational. Early consultation is necessary to identify areas where national top-ups, co-funded calls or alignment with NECP and national R&I priorities would add value.
- Administrative capacity should be scaled progressively. The Wind Fund should begin with a lean secretariat, but with clear provision for reinforcement as the call portfolio expands and financial instruments become more complex.
- The transition pathway should include an early review point after the first full year of operation. This review should assess whether the hosting arrangement, governance balance, time-to-grant performance and coordination mechanisms are functioning as intended and whether any adjustments are needed before the Wind Fund reaches full scale.

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