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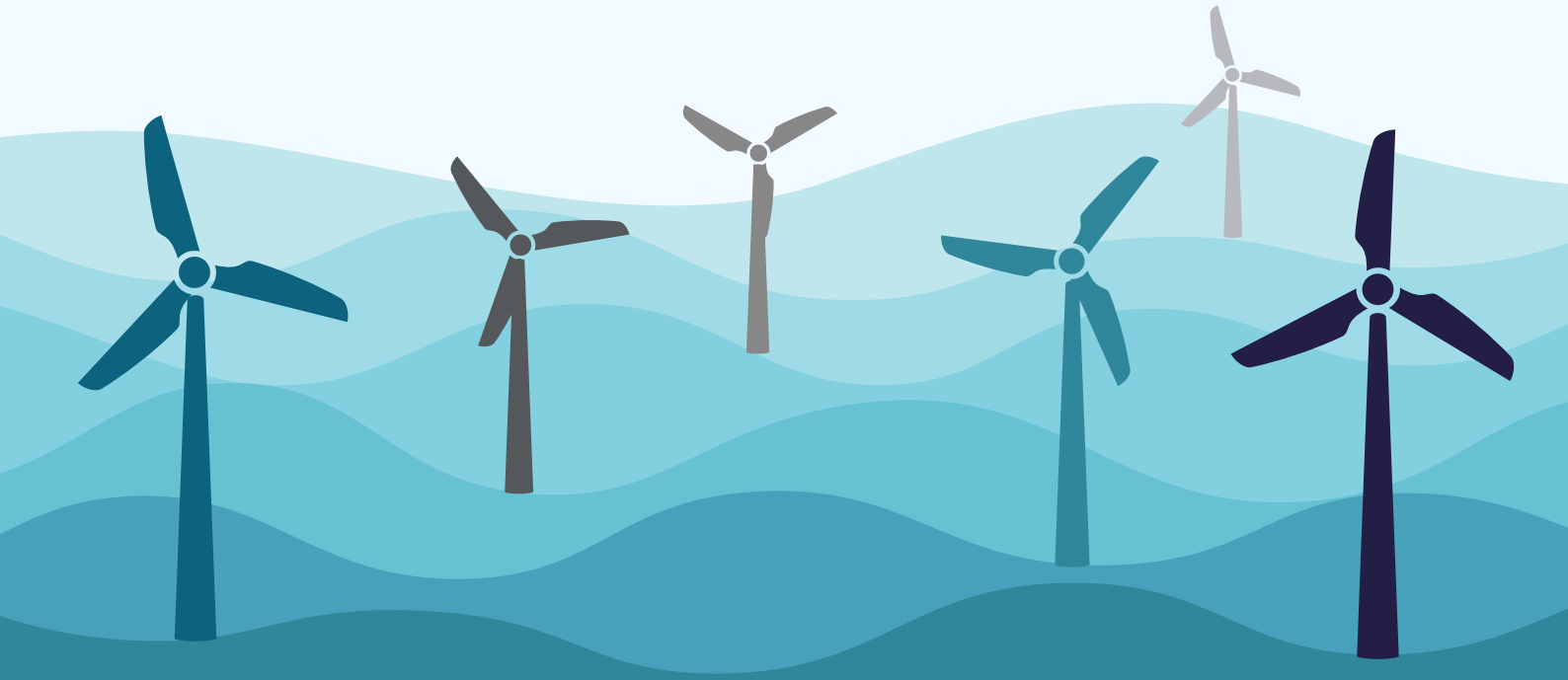
The SET-Plan Implementation Working Group for Offshore Wind

A summary outline of the 2nd SET-Plan Implementation Plan for Offshore Wind



1. Introduction

An ambitious Europe requires an ambitious Implementation Plan for Offshore Wind

The Implementation Working Group for Offshore Wind (IWG Offshore Wind) took over from the Temporary Working Group for Offshore Wind in 2019 to advance the SET-Plan Implementation Plan for Offshore Wind towards the agreed technology targets. It consists of interested SET-Plan countries and relevant industrial and research stakeholders. It is supported by the SETWind project.

The development in offshore wind energy over the past few years has been truly breath-taking. In 2018, turbine manufactures broke through the 10MW barrier for turbine size; in 2019, Hornsea 1 became the first GW wind farm; and in 2020, the first concrete plans for energy islands were announced. At the same time, offshore wind has gone from being predominantly a North Sea phenomenon to become part of the energy system planning for all European sea basins from Norway in the north-west all the way around to the waters of the Black Sea in the south-east.

On the technology side, the prospect of floating wind power as a commercially viable technology within a 5-10 year horizon has opened up vast areas of the ocean for wind power in Europe and globally. Meanwhile, policies for national and international coordination is starting to shape the future energy systems capable of incorporating between 300 and 450GW of offshore wind by 2050.

The Offshore Renewable Energy Strategy presented by the European Commission on November 19th outlines the paths to achieve 300GW in EU-27 waters by 2050.

The Commission strategy highlights that investments and a predictable legal framework are essential to enable EU to multiply currently installed offshore wind power capacity by almost 30 times by 2050. Supported by regional cooperation for enhanced maritime spatial planning and continued efforts to maintain Europe's technological leadership through research and innovation, this will help drive down costs, increase the value and further improve the sustainability of offshore wind power.

With these developments, it was clear early on for the SET-Plan Implementation Working Group for Offshore Wind (IWG Offshore Wind) that the first Implementation Plan delivered in June 2018 needed an update.

This summary outlines the main elements of the 2nd SET-Plan Implementation Plan for Offshore Wind, which is due in the first quarter of 2021. The document is still work in progress and is intended to inform the wider SET-Plan community.

2. Key challenges for offshore wind

Offshore Wind Energy in Europe – key figures

Four key challenges for offshore wind energy

For decades, research and innovation in offshore wind was focused on making the technology cost competitive. While cost reductions remains a key challenge for offshore wind to deliver its full potential, the opportunities and challenges now require a more holistic perspective.

Based on current developments in industry, policy and research, the IWG Offshore Wind has summarised the following four main challenges to be addressed by offshore wind energy R&I in the coming decade:

1. Cost

The scale of installation, a stable policy framework and R&I outlined in the six priority actions of this Implementation Plan will be key drivers in reducing the cost of offshore wind from design to decommissioning.

2. Value

Cost reductions of wind power must go hand in hand with a focus on increasing the value of wind. Energy system integration and sector coupling are key to this as they enable greater scale and flexibility in the market for green electricity.

3. Sustainability

The offshore wind energy sector needs to fully integrate sustainability both environmentally and socially. Through circularity, marine spatial planning and active engagement of the many users of the sea, wind power will continue its significant contribution to combat climate change and ensure a healthy offshore environment.

4. Regional conditions

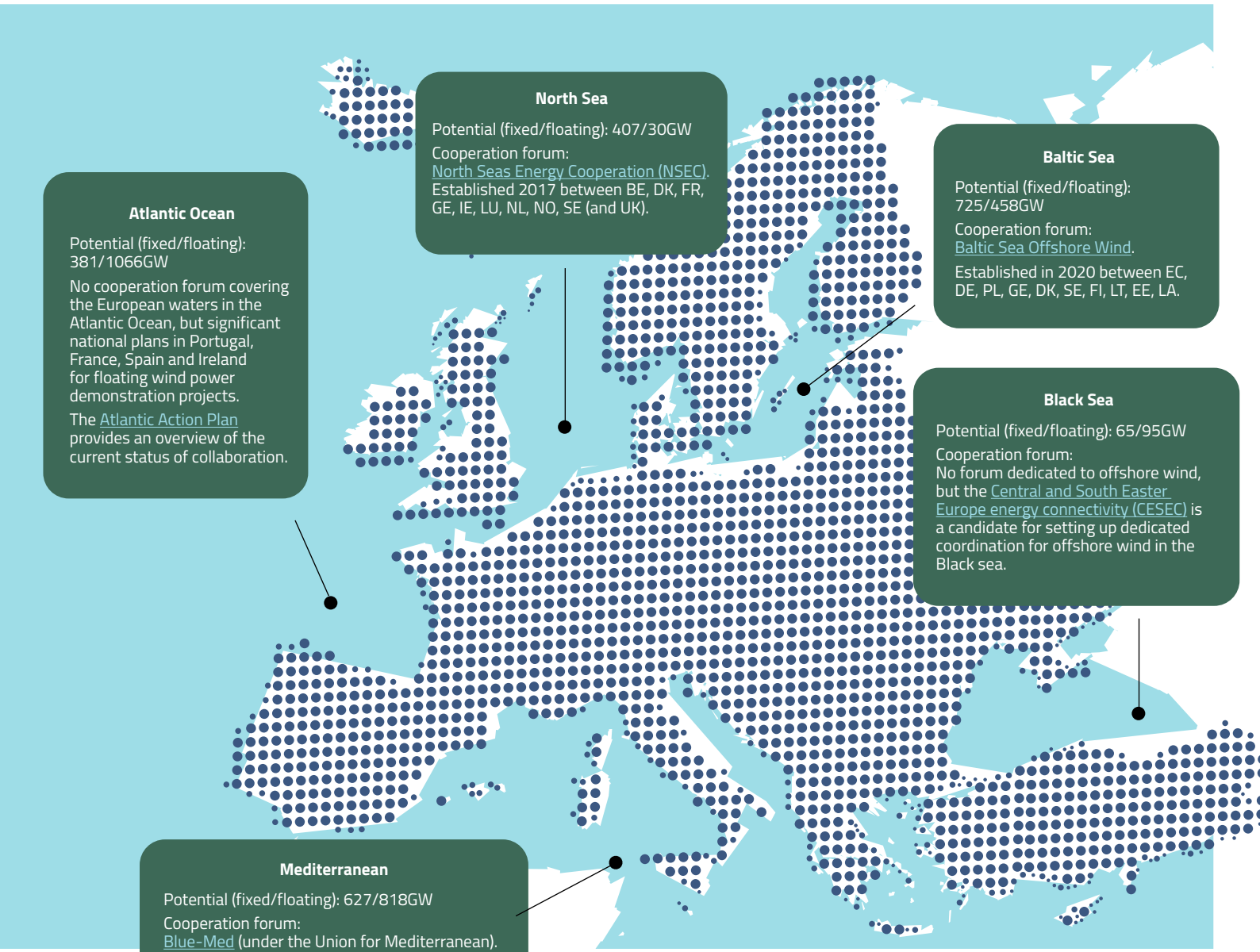
Offshore is not one uniform environment. External conditions from water depths to wind and waves influence the technology innovations required and different infrastructures for both energy systems and logistics create different frameworks for each wind farm project.

3. Regional cooperation in the EU

In 2018, only two years ago, offshore wind power was predominantly a North Sea adventure. In 2020, plans for offshore wind power are now part of national policies from Norway in the north-west of Europe to Romania in the south-east. The development in the North Sea shows that in order to utilise the full potential from offshore wind power, national policies will have to go hand-in-hand with regional cooperation on infrastructure, policies and planning. This is also reflected in the EU strategy for Offshore Renewable Energy.

For the Implementation Plan for Offshore Wind, *regional conditions* is one of four key challenges for offshore wind. Understanding and monitoring development in this area is therefore key for the IWG Offshore Wind.

As part of the updated Implementation Plan, the IWG Offshore wind is therefore mapping the progress in regional cooperation for offshore wind in Europe.

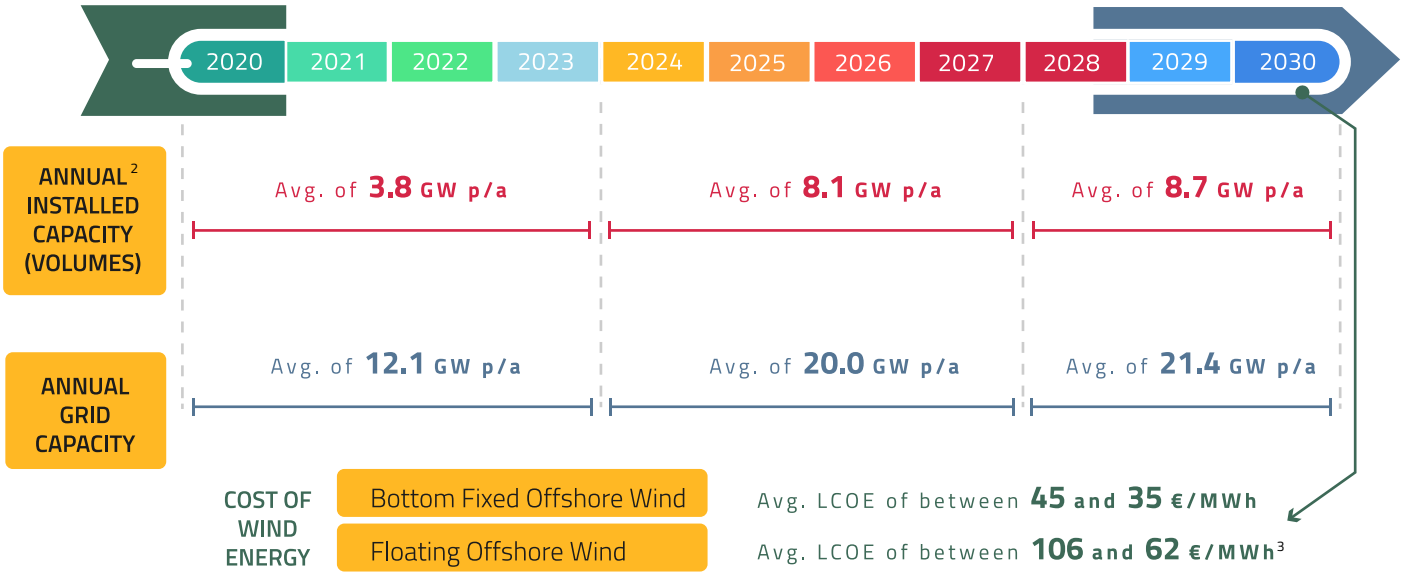


4. SET-Plan strategic targets

The European Commission has set a target of 300GW of offshore wind for EU-27 and up to 450GW for all of Europe by 2050 to power Europe's green transition. Offshore wind can deliver on these ambitions, but it will require a substantial scale-up of research, innovation and agile adaptation of the regulatory frameworks to drive the scale and volume needed by 2050. To reach up to 450 GW of offshore wind, the installation rate needs to increase dramatically. To be exact, Europe would need to install 20 GW per year from 2035 onward up from 3.6 GW in 2019

To deliver at least 300GW, cost reductions in offshore wind will need to continue. This can only be achieved through large-scale investment and deployment supported by technology improvements and innovations. Targeted R&I must help deliver the technologies and the science needed to accelerate deployment and bring down costs while also improving system value and sustainability.

The IWG Offshore Wind has set the following four targets for offshore bottom-fixed and floating wind power by 2030.[1]

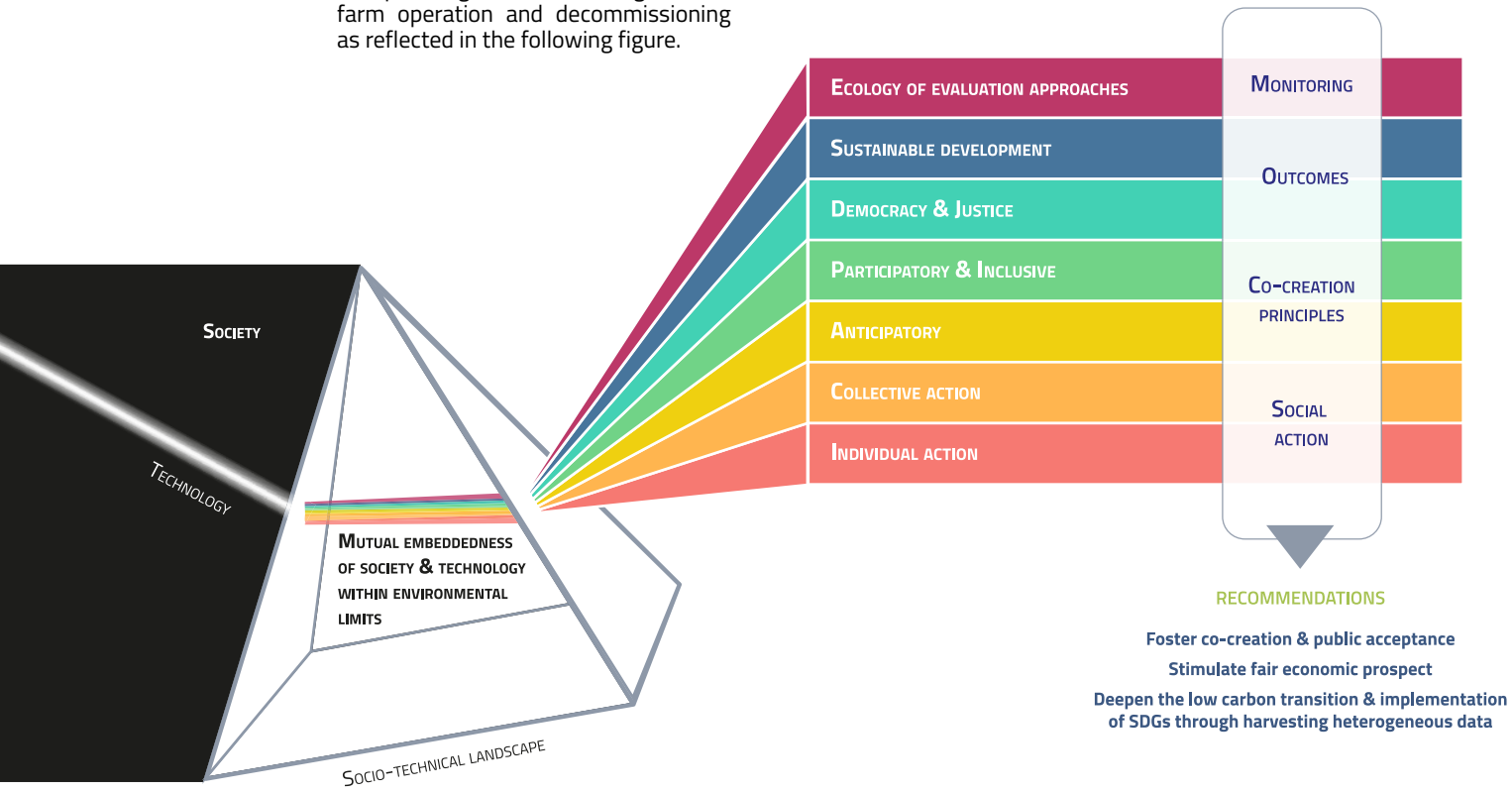


1 The targets for annual installation presented here are based on the 450GW target for all of Europe.
2 This electrical grid capacity is needed to deliver the goals of the energy transition. It is important to note that a parallel out-build of pipelines will be needed to deliver Green Hydrogen and Green Ammonia to industry; power generation, steel mills, chemical plants; transport and agricultural sectors.
3 Figures according to https://etipwind.eu/files/reports/ETIPWind-floating-offshore-wind-factsheet.pdf

5. Social science and humanities

Today's offshore wind power is a testimony to decades of research, innovation and engineering ingenuity in the entire value chain. But offshore wind power of tomorrow is also an energy production system that needs to be embedded in the wider society. That is why the 2nd Implementation Plan for Offshore Wind will include a section on the contributions of social science and humanities (SSH) research and innovation to offshore wind[4].

SSH offers a range of tools and methods for offshore wind stakeholders to use from the early phase of policy and planning and to the stage of wind farm operation and decommissioning as reflected in the following figure.



SSH Recommendations for Offshore Wind

- **1st recommendation "Foster Co-creation & public engagement":** Co-creation starts with how we organise ourselves (e.g. in R&D and policy organisations) and how we seek to engage others. Processes allow for both problems and solutions to be inclusively deliberated and co-produced with a wide range of interconnected stakeholders. A co-creation process begins at the start of the process, not at the end of it.

- **2nd recommendation "Stimulate fair prospects":** In line with the European Green Deal, offshore wind must contribute to a just and fair transition for all citizens. This includes the distribution of costs and benefits, but also a shared understanding of the need to speed up the transition and consequently also the build-out of offshore wind.

- **3rd recommendation "Deepen the low carbon transition & implementation of SDG through harvesting heterogeneous data":** The achievement of the UN 2030 Agenda and the Paris Agreement requires monitoring and reporting systems at different scales, also extending towards business reporting and regulatory compliance. Their effectiveness relies on measurable goals, indicators and high quality data. The latter includes both quantitative and qualitative data.

4 This section is developed together with the Horizon2020 project Energy_Shifts that acts as the European innovation platform for SSH in the field of energy (https://energy-shifts.eu/) as well as the EERA Joint Programmes e3s and wind (see https://www.eera-set.eu/)

6. Lighthouse initiatives

Following an extensive consultation process with the stakeholder community in the SETWind project, the implementation working group recommends a concerted effort towards two lighthouse initiatives for offshore wind energy.

The lighthouse initiatives address two areas:

- **Floating offshore wind technology** to make floating offshore wind cost competitive.
- **Integration of large-scale offshore wind energy** to enable the future reliable operation and zero emission of the power system.

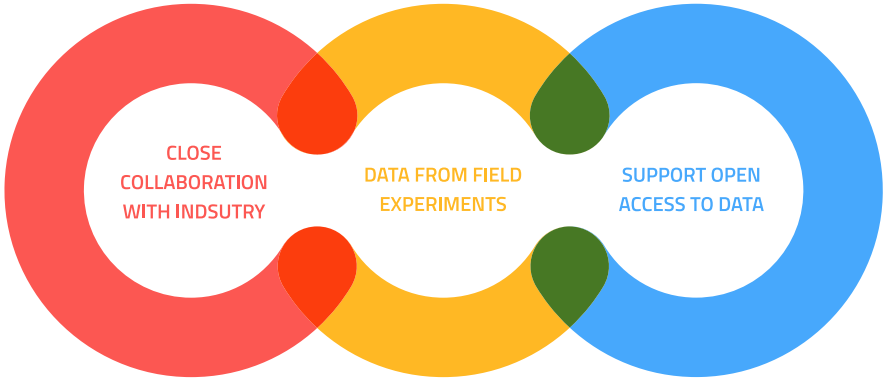
The science and engineering challenges are well documented and these include a long list of topics of which a selection can be made to constitute a lighthouse research project[5][6]. To support the wider capacity building for innovation in Europe, the lighthouse initiatives should mainly focus on lower TRL research up towards qualification in laboratory scale.

The term "lighthouse initiative" refers to a visionary, science-driven large-scale initiative with significant budget (tens of millions of Euros) and duration (5 years or more) that will address grand scientific and technical challenges that are crucial for the further advancement of offshore wind energy, providing new knowledge and basis for innovation.

Fundamental research questions need to be addressed to enable the development of wind energy to its full potential. Here there lighthouse initiative draw on three grand scientific challenges described in a recent article in Science[7] by a group of highly acclaimed wind energy experts. The challenges are:

- Improved understanding of atmospheric and wind power plant flow physics.
- The interaction between aerodynamics, structural dynamics and hydrodynamics of enlarged floating wind turbines.
- Systems science for integration of wind power plants into the future electricity grid.

An attractive and impactful lighthouse initiative will build on



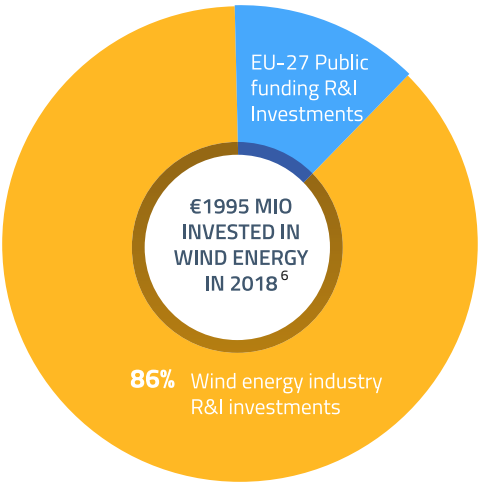
5 www.ETIPWind.eu
6 www.eerajpwind.eu
7 Paul Veers et al, 2019, Grand challenges in the science of wind energy, Science Vol. 366, Issue 6464, https://science.sciencemag.org/content/366/6464/eaau2027/tab-pdf

7 Priority actions

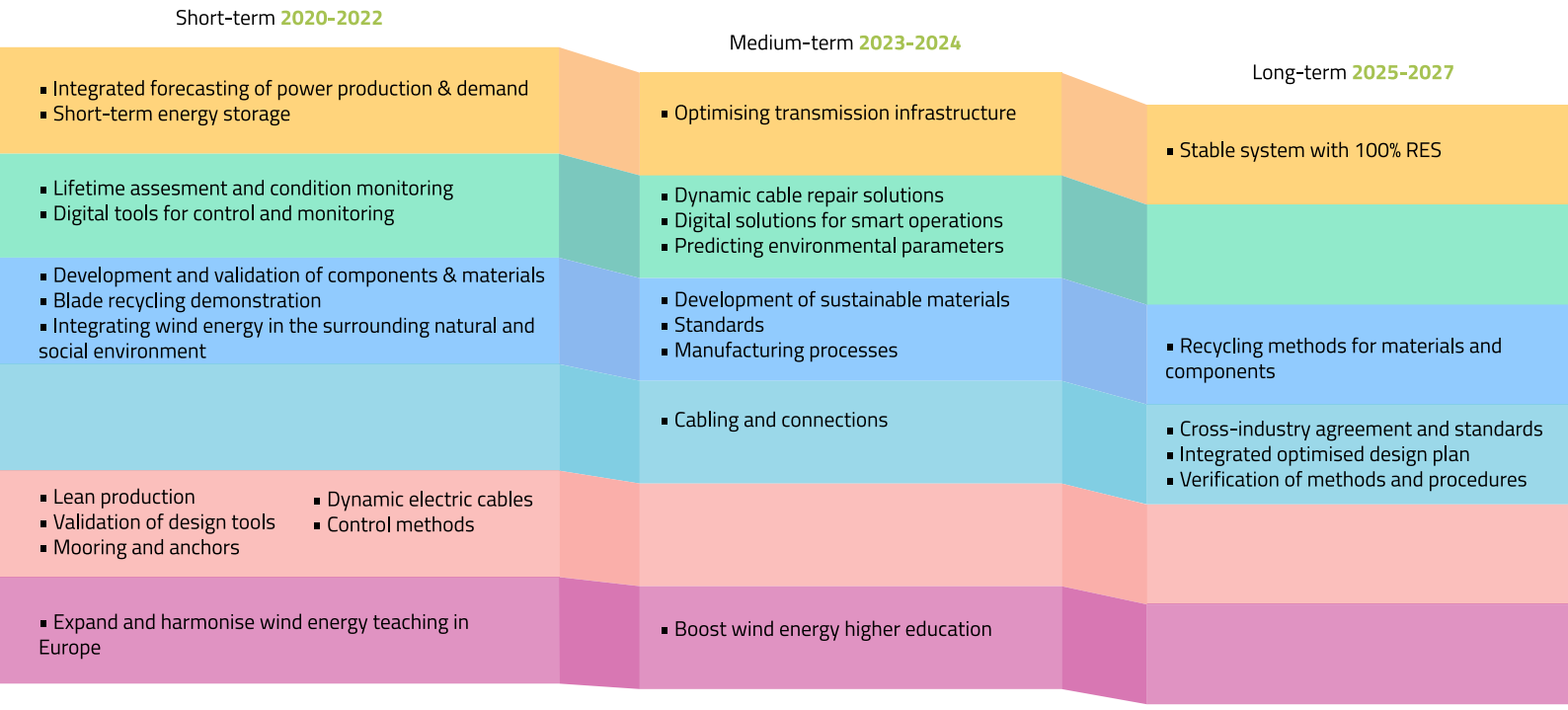
In the updated SET-Plan Implementation Plan for offshore wind, the priority actions have been developed using existing strategies within the SET-Plan community from the European Technology and Innovation Platform on Wind Energy (ETIPWIND), the sub-programmes of the European Energy Alliance Joint Programme on Wind Energy (EERA JP WIND) as well as the International Energy Agency - Wind Energy Technology Collaboration Programme (IEA Wind TCP).

This has resulted in six different priority actions:

1. Wind Turbine Technology
2. Offshore Wind Farms & Systems Integration
3. Floating Offshore Wind & Wind Energy Industrialisation
4. Wind Energy Operation, Maintenance & Installation
5. Ecosystem, Social Impact & Human Capital Agenda
6. Basic Wind Energy Sciences



These have been further subdivided into subtopics, which can be seen in the illustration below[9].



8 figures from ETIPWIND analysis of R&D investments.
9 The division into short-medium and long term topics are adated from the ETIPWIND Technology Roadmap 2019: https://ETIPWind.eu/files/reports/ETIPWind-roadmap-2020.pdf

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setwind.eu

The SETWind project supports the implementation of the SET-Plan Implementation Plan for Offshore Wind. The project has been developed in consultation with the Temporary Working group that authored the Implementation Plan and key stakeholder organisations including ETIPWIND, WindEurope, the EERA Joint Programme for Wind Energy, the IEA Wind TCP and the European Commission's Joint Research Centre in Petten.

The SETWind project will update and work with the Implementation Plan to maintain it as a dynamic reference point for offshore wind energy research and innovation.

It will monitor and report on progress towards the Implementation Plan targets of 1090 million € to be invested in R&I in the offshore sector until 2030.

It will strengthen policy coordination in European offshore wind energy R&I policy by supporting the work of the SET-Plan Implementation Group for Offshore Wind.

It will facilitate a breakthrough in the coordination across borders of nationally funded R&I projects.

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