OFFSHORE RENEWABLE ENERGY

Resilience Preparedness Report

March 2024

ELBE EUROCLUSTER

This document is part of the ELBE EUROCLUSTER project (GA– 101074230), which has received funding from EISMEA's COSME Programme (call SMP-COSME-2021-CLUSTER)

Offshore Renewable Energy
Resilience Preparedness Report

RISE Research Institutes of Sweden
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1. Introduction

1.1 Aim & Scope

This report aims to identify existing challenges and gaps in the European ORE sector in order to better understand resilience measures needed for sector preparedness. For the purpose of this work, we will focus on Hight Impact Low Probability (HILP) events caused by external, uncontrollable factors (such as natural cataclysm, COVID 19-pandemics, armed conflict, etc.) and not a crisis caused by misjudgments within the company (Carmeli & Schaubroeck, 2008).

The report will first provide an overview of ORE importance from the aspect of the achieving Green Deal Agenda and climate neutrality of Europe by 2050. Secondly, it will assess the critical risks and challenges that affect the sector during the HILP events. Finally, it will describe elements that can strengthen resilience preparedness and provide recommendations on policy level.

Besides desktop research that will provide a general overview of the situation in regards to resilience of ORE sector, this paper will also include industry feedback from ELBE Eurocluster companies as a field input to the resilience challenges and what they need as support to cope with the crisis .

Since ELBE Eurocluster is to a large extent covering most of the ORE value chain, it can be in this sense viewed as a representative sample with good indication of the trends, challenges and opportunities related to resilience aspects investigated herein.

In terms of subsector, the report will primarily focus on bottom fixed offshore wind, as a most commercially advanced subsector compared to other subsectors, namely, floating offshore wind, wave and tidal which are still in pilot and pre-commercial validation phase.

The report shall serve as a reference material both to companies and relevant authorities to better understand challenges and crisis events affecting ORE sector and how to develop resilience preparedness plan and measures to increase their resilience and adequately address these events.

1.2 Research Methodology


1. Desktop review of existing literature


2. Online survey ELBE EUROCLUSTER


3. Alignment with European Support Networks, ECCP and EEN

ELBE Eurocluster online survey

The survey was conducted online in May-June 2023. It covered 47 companies, the members of ELBE Eurocluster from Spain, Poland, Denmark, Belgium, France, Norway and Sweden. 81% were active in offshore wind, 15% in wave and 4% in tidal energy. The survey included a mix of experienced companies and new-comers with majority of companies being mid-sized (from 11-49 employees).

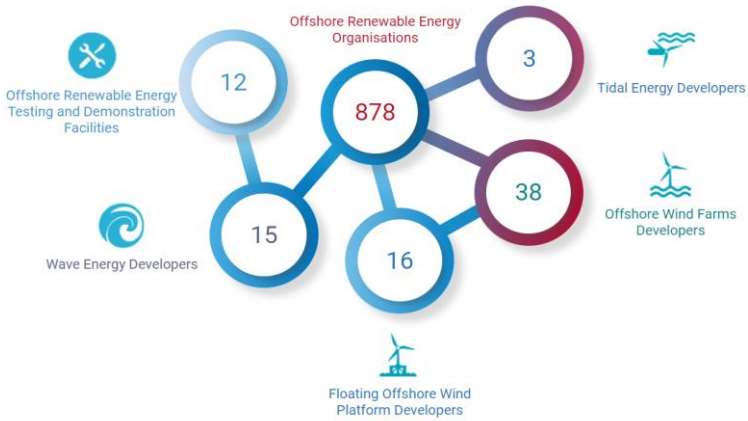
The following companies contributed to the survey:

24SEA; Alerion; Bota Green Offshore; CorPower Ocean AB; Cspect; DECO Subsea; Einar Øgrey Farsund AS; Elmark Sp zoo Sp k; Energy Market Observer sp. z o.o.; Fairplay Towage Polska; Flint Systems Sp. z o.o., FORSSEA ROBOTICS; Freja Offshore AB; GAINZA FORGE , S.L; Gradius Tomasz Dębiec; Green Ducklings; Hexicon AB; HR INVEST Energy; HWS CONCRETE TOWERS S.L.; Inalia; ISATI ENGINEERING SL; JASO EQUIPOS DE OBRAS Y CONSTRUCCIONES S.L.; LUMIKER APLICACIONES TECNOLOGICAS S.L; Nava Engineering Gdańsk Sp. z o.o.; Navitest sp. z o.o.; Nekkar ASA; NOVELTIS; Novige AB; Ocean Harvesting Technologies AB; Ocean Ventus AS; OCEANIDE S.A.; Ocergy; PRINCIPIA; PROTEA; SeaTwirl; SolarinBlue; SOVERIN CONTROL; Subsea Tech; TALLERES AMENABAR S.A.; The Gdynia Maritime School; Tubes International; Vulcan Training & Consultancy; W4P Waves4Power AB .

1.3 ELBE Eurocluster

ELBE Alliance was initiated in 2016 to support internationalization and supply chain development among European renewable offshore energy clusters. In 2022, Alliance became EU funded Eurocluster to support collaboration of Blue energy clusters from 8 countries: Spain, Norway, France, Belgium, Sweden, Denmark, Poland, UK. With around 1000 members spread all over value chain, 12 test and demo sites and 72 technology developers in offshore wind, wave and tidal energy it represents one of the leading European Blue energy clusters. More info: http://www.elbealliance.eu/home

ELBE ALLIANCE GATHERS THE MOST ADVANCED REGIONS IN THE EUROPEAN OFFSHORE RENEWABLE ENERGY SECTORS, WITH WELL-KNOWN KEY INITIATIVES IN A GLOBAL SCALE



CONSORTIUM

LEADER

Cluster Energía BASQUE ENERGY CLUSTER

BLUE CLUSTER

energy ENERGY CLUSTER DENMARK

GCE NODE

OFFSHORE VÄST

PÔLE MER MEDITERRANÉE

POMERANIAN PLATFORM FOR OFFSHORE WIND

areg ABERDEEN RENEWABLE ENERGY GROUP - Associated partner

2. Strategic importance of ORE Sector in Europe

The energy sector is essential for maintenance and development of all aspects of modern life and industrial activity. Fossil fuels (coil, oil, natural gas) have been dominant energy sources ever since Industrial revolution. However, this type of energy system has been characterized with volatile and insecure supply and due to green house gas (GHG) emissions have hazardous global warming impact. Renewable energy sources (RES) do not generate GHG emissions during operation and as such are recognized as safer and cleaner alternative that can deliver a sustainable energy system in Europe by 2050. In particular, offshore renewable energy sources such as wind, wave and tidal have enormous potential to generate green electricity from European sees (EU Strategy on renewable offshore energy 2020).

The renewable offshore energy and more specifically, offshore wind has enormous potential to generate emissions free and renewable electricity for European cities and industry. EU Strategy of Offshore Renewable Energy sets out 60 GW of installed capacity for wind and 1 GW for ocean energy target by 2030, and at least 300 GW and 40 GW respectively by 2050. This should be achieved by mass investment of at least 800 billion EUR in technology development, scaling up components, as well as adjusting and developing value chain.

However, with a first offshore wind farm constructed in 1991 in Vindeby (Denmark), ORE is still a relatively ”new” industry compared to traditionally established sectors. There is a big gap between currently installed and the targeted capacities of offshore energy to be deployed by 2030 and 2050. The total installed offshore wind capacity in Europe in the first quartal of 2023 was around 30 GW, mainly bottom fixed, with few exceptions of the pilot floating wind farms (Wind Europe, 2023). Ocean energy - wave and tidal converters- are also in the validation phase with few prototypes totaling 43 MW of installed capacity in 2022 (European Commission, 2023). The entire ORE sector is not yet ready for mass scale commercialization due to law technology readiness level for floating offshore wind, tidal and wave energy with most of the concepts being still in test and demo phase.

In order to reach the 2030 offshore energy targets, both offshore wind and ocean energy need to start growing rapidly every year increasing volume of orders and production scale. Besides financial investments needed, there are other issues that create hurdles for this sector such as access to critical raw materials, availability of mature value chains, port infrastructure, scaling up production, etc. Currently, most of the critical raw materials and production value chain including major shipyards for offshore renewable energy projects are located in China and Asia, which makes the sector highly dependable on these markets.

Renewable energy sources have strategic importance for Europe as a key driver to mitigate global warming and achieve climate neutrality by 2050 as outlined in Green Deal Agenda (2019) . Since its launching, European Commission has introduced number of policies and measures to implement the Agenda and strengthen the renewable energy sector , such as Fit for 55 (2021) to include at least 40% of the RES in overall mix 2030. In 2022, RePower plan Europe (including Recovery and Resilience Facility) was presented following Russia-Ukraine war to reduce European dependency on supply of Russian gas and provide energy security and independence via increasing targets of RES to 45% and proposing a set of policies to simplify permitting process. In 2023, European Commission introduced Green Deal Industry Plan (GDIP), a set of policy proposals to further enable clean energy transition and make Europe leader in clean technology sector (European Commission, 2023).

The Plan is based on 4 pillars:

1. Predictable and simplified regulatory environment
2. Faster access to funding
3. Enhancing the necessary skills
4. Facilitating open and fair trade

The Green Deal Industrial Plan represents in this sense an EU attempt to minimize the risks by introducing a set of reforms that should address growing concerns from the industry which is calling for protection of renewable energy sector. The ”protective” measures should help make the sector more resilient to external uncertainties associated with permitting procedure, inflation, access to raw materials, value chains disruptions, etc. (Siemens Gamesa Renewable Energy, 2022). Responding to industry demands, in October 2023, the Commission presented 2 wind power packages that should speed-up wind energy manufacturing and deployment in Europe.

However, the expansion of offshore wind and ocean energy would require from EU and national governments a coordinated action to implement measures related a tailored made EU public funding instruments targeting RES focusing on developing promising technologies for zero net gas emissions and scaling up clean tech supply chains as well as support establishing new critical raw materials trade routes and EU alternative manufacturing to decrease current dependency on non-EU suppliers (Rystad Energy, 2023).

3. Why resilience is needed?

SMEs running their businesses within offshore renewable energy are facing several challenges during the usual, non-crisis periods of operation. However, in times of unexpected events, the ORE sector is additionally exposed to risks that can undermine their survival. Being one of the most vital sectors in Europe, the resilience of ORE sector is hence of utmost importance to help sustain and strengthen the robustness of industry during the unexpected events.

HILP events interrupt supply chain and create long term problems to wind farm developers who had to deal with unexpected costs as well as logistic hurdles. For example, Covid-19 pandemics have created supply chain disturbances, lack of wind turbine components supply, delays in manufacturing as well as created backlog at the ports. Energy crisis caused by Russia-Ukraine war in 2021 has raised prices of raw materials and delayed delivery of components and materials.

In this sense, resilience is understood as an ability to handle unforeseen changes and keep developing businesses in a long-term perspective. There are different aspects of resilience: on one side there are companies that go back to "business as usual" after the crisis, on the other there are companies that can adapt and develop during crisis. The latter is important when facing long term disruptions. Saad et al. (2021) states that resilience should cover both operational and dynamic capability, where operational capability focuses on firm growth whereas dynamic capability means the ability to adapt and seize business opportunities "amid challenging business environment".

Research has shown that SMEs are not as well equipped as larger corporations to handle crisis, mainly due to lack of resources. In the wake of the COVID-19 pandemic, SMEs had been implementing number of actions including: upgrading digital services, diversifying suppliers, improving employee well-being, shifting or downsizing the business. The uneven demand, supply chain disruption and financial shortage are the largest risks when it comes to business resilience. Other identified risks are shortage of staff, border restriction, extreme weather conditions and difficulties reaching out to customers (Brown et al., 2022).

Finally, the resilience cannot be achieved by one SME acting on its own, meaning that partnership and clusters are necessary in order to reach resilience within organizations (Seville et al., 2006).

In order to understand how ORE sector can improve its resilience, one needs first to understand what represents the major risk to companies operating in this sector.

The next section identifies key challenges the sector is dealing with in times of crisis event.

4. Critical challenges and gaps

1 . Predictability

Offshore wind is characterized by single but very large orders with high investment costs, making it difficult to manage cash flow. Total investment orders in wind industry in Europe fell by 47% as compared to 2021 due to inflation and market interventions (Wind Europe, 2023). Across EU members states, there are differences in plans and actual announcement of tenders /auctions for offshore wind zones that gives uncertainty to entire value chain about the expected construction time. That is often due to regulations governing the offshore permits in view of socio-economic risks.

Hence, the predictability and permitting process pause significant challenge to the sector, but interruption in times of HILP events can easily lead to loss of business for most of them as they face difficulty to raise capital, due to longer lead times and lack of access to quick support incentives and financial instruments.

2. Disruptions in supply chain

Majority of raw materials and components for offshore wind farm / ocean energy pilots have been produced outside Europe.

In 2022, the largest share of the materials used for wind turbines were iron and steel (65%) followed by cement (20%) (Rystad Energy, 2023). China is world largest steel producer. Also, Rare Earth Elements (REE) which are used for permanent magnet generators in direct drive-in wind turbine are imported solely from China (98%). In 2021, 50% of steel plates were imported from Ukraine to EU and both Russia and China contributed to 93% of slab import to EU.

The unexpected events create severe interruptions in delivery of supplies and make sector vulnerable. In particular, the European wind turbine manufacturers have faced losses and operational delays due to decreased volume of orders, stopping production during quarantine (pandemics), stock rupture, components piling up in ports, and down delivery time due to interruptions of the logistic operations.

3. Technology challenges

Renewable offshore energy is high-tech innovation driven sector with large costs investment in demonstration and validation of the technology (i.e. simulation hardware, test beds and lab infrastructure , high-end engineering, etc.). Innovation in new materials and components for offshore energy devices can significantly reduce the CAPEX in commercial projects . It requires specific set of labour skills that is often hard to find in the market, which in turn increases investment costs and requires training programs to educate labour force for this new industry. During Covid-19 pandemics, the technology challenges were augmented by quarantine and isolation that slowed the pace of innovation, trials and validation of the technology concepts.

4. Logistics & installation

In general, offshore energy projects are often taking place in environments that are complex and demanding in many ways. Establishing power plants at sea is logistically challenging and expensive because the plants are exposed to large environmental loads and often located in inaccessible areas. Subsea installations put high demands on the facilities not only during installation phase but also during operation and maintenance phase. Some building techniques also require high demand on the personnel, for example when there is subsea technical equipment with maintenance needs.

Logistic bottlenecks are another complication that becomes a critical challenge during unexpected events. Associated problems are unavailability of labor due to quarantine and isolation, interruptions in operations due to waiting on major components, stockpiling at harbors etc.

5. Inflation

Offshore wind contracts are characterized by long time between contract award, permit and final investment. This reflects in inflation which is an ongoing challenge to sector during the normal operations, but it augments the business risk in time of unexpected events. During Covid-19 pandemics as well 2021 energy crisis in Europe, the prices of raw materials, production, manpower costs, capital costs across entire value chain of wind industry went up. This created delays in project completion and led to uncertainty in subcontracting across entire value chain.

In some countries (France, Poland, UK) high prices increase is offset by inflation indexation (dynamic inflation compensation), but more aligned and coherent measures are needed across Europe to strengthen sector´s resilience and ensure the contracts are delivered as planned (Siemens Gamesa Renewable Energy, 2022).

5. Feedback from the industry

5.1 Impact of the crisis

Within the scope of this report, an online survey was conducted on a representative sample from ELBE EUROCLUSTER companies to investigate what was the impact from Covid-19 pandemics and energy crisis on companies´ operation and how did they deal with the crisis.

78% of the surveyed companies stated they have been affected by the crisis fully or to some extent which exposed their business operation to risks. Overall, there were no peculiar difference in responses between companies operating in subsectors of offshore wind, tidal and wave energy – in this sense the entire sector has been struggling with the similar issues during the crisis events and has similar resilience needs.

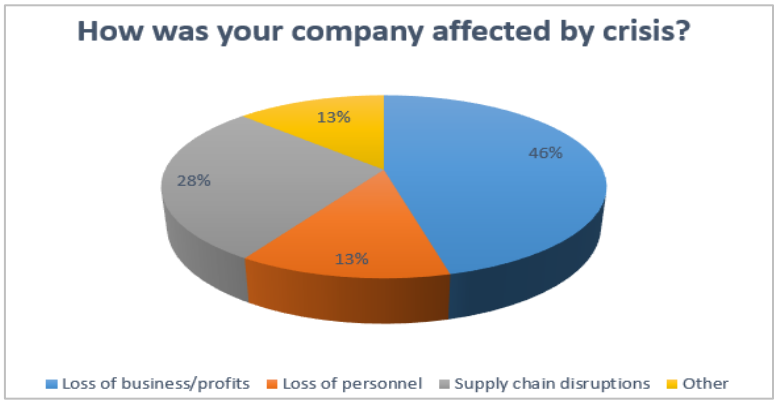


Figure 1: Impact of the crisis (ELBE Eurocluster survey, 2023)

In respect to challenges, companies pointed out that largest impact from the crisis was loss of business /profit followed by disruptions in supply chain and loss of personnel (Figure 1). Companies faced costs increase and challenges with project finance and operation which is in line with desktop research findings identified above. The largest impact of crisis on technology was price increase, lack of materials and electronic components, lack of qualified suppliers, lack of investors willing to finance, serial production interruption, delivery times delays and reduced government announcements of tenders.

66% companies received none or limited support from EU/State/Region level to alleviate effects of the Pandemics of Energy crisis. Of those that received some support, 74% stated that it did not help them recover their businesses after the crisis.

5.2. Response to the crisis

In terms of companies´ response to the crisis, the primary action was to change the business/market strategy and make adjustments in the supply chain. Other actions included acquiring new skills, technology changes, loans, personnel cuts and reorganization (Figure 2). The companies mentioned that it is important to diversify services to include the sectors that can secure the contracts, ensure a larger financial buffer (by getting affordable loans, raising additional investments, EU grant funding, etc.), invest in training, new knowledge and technologies and have resilience preparedness or business continuity plan in place.

On a policy level, the most important support measure would be having quick access to financial incentives that can be available in times of crisis to offset price increase and disruptions in supply chain. Besides that, companies have indicated that internationalization and government support to access alternative markets can contribute to strengthen resilience (Figure 3).

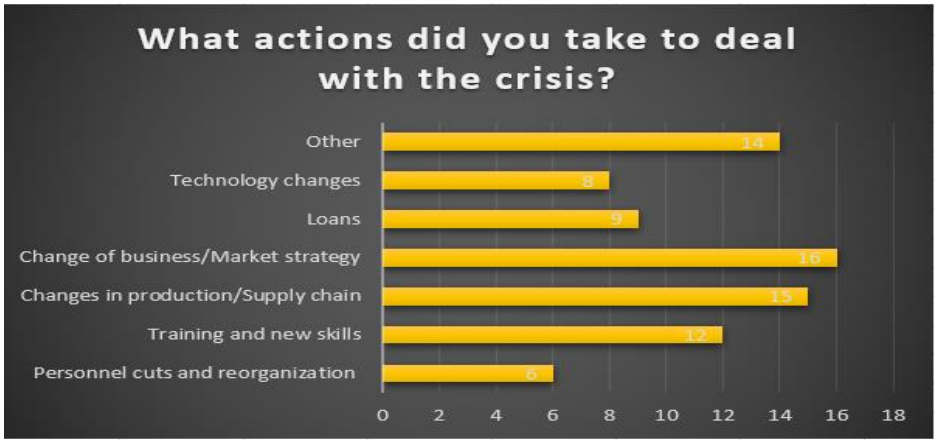


Figure 2: Response to the crisis (ELBE Eurocluster survey, 2023)

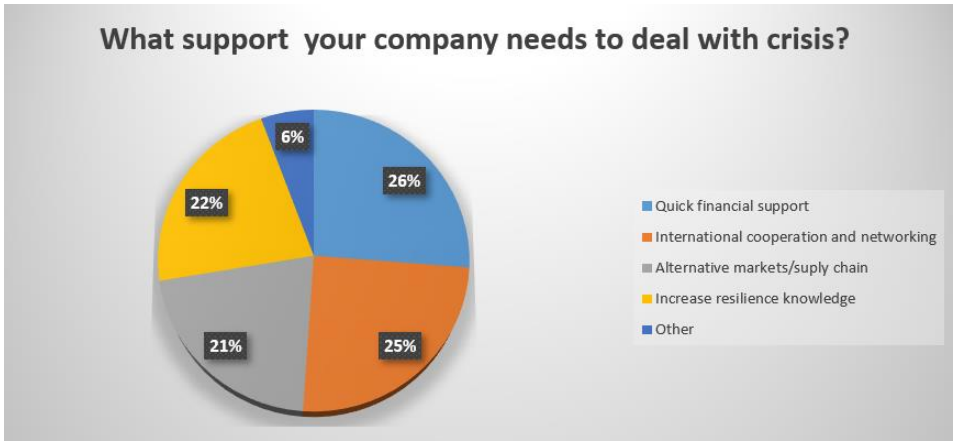


Figure 3: Measures to support resilience (ELBE Eurocluster survey, 2023)

5.3 Key recommendations based on survey

1

Increase resilience knowledge

Develop Business Continuity or Preparedness Plan. Invest in strong team of employees, support them with innovative solutions skills, capacity building and updated knowledge on trends and developments in the industry .

2

Access to financial incentives

Apply for EU grants or low-interest loans or regional projects to bridge the gap between financing. Seek support from the regional or national advisory and financial institutors to plan timely budget support or alternative financing mechanism.

3

International cooperation and networking

Via cluster collaboration identify alternative suppliers in Europe and outside of Europe. Enterprise Europe Network (EEN) can help companies to assess their resilience preparedness, provide advices on EU funding , supply chain diversification and adaptation of business strategy.

4

Invest in R&D and technology

Alternative materials produced in Europe reduce dependencies on non-EU production and import. Investment in digital systems back up the business and create potential alternative services that can save the company during the time of crisis.

6. Business Continuity Plan

The risk response and mitigation strategy of an organization is usually summarized in a document Business Continuity Plan (BCP) which ideally covers the elements of prevention/mitigation, preparedness, response and recovery (State of Queensland, 2022). The Plan is seen as a tool to the organization to identify potential risks, analyze their impact, and plan resources for response and recovery. It should help the companies design the actions to take before, during and after the crisis. The survey showed that 32% of the companies currently do not have Resilience strategy or Business Continuity Plan, but 51% stated they were working on it which means they see the urgency of having the plan in their organization to be able to cope with crisis in a systematic way.

Business Continuity Plan should ideally include the following elements:

RISK ASSESSMENT	Identify HILP events threatening the business e.g. natural disasters, extreme weather, cyber attacks, power outages etc.
BUSINESS IMPACT ANALYSIS	Evaluate impact of the identified events on the entire business supply chain. Include aspects as reputational and legal impact.
RECOVERY OBJECTIVES	Describe how to recover in the event of disruption, how to restore essential functions, mitigate financial losses and minimize impact on customers and employees.
EMERGENCY RESPONSE PLAN	Describe evacuation procedures, communication protocols, and emergency contacts.
CONTINUITY PLAN	Describe how the business will continue to operate during the disruption, including alternative locations, backup systems and key personnel roles and responsibilities.
COMMUNICATION PLAN	Develop a plan for communicating with employees, customers, suppliers, and other stakeholders during the disruption.
TESTING AND MAINTENANCE	Have procedures to review the BCP regularly, making sure it is up to date.
TRAINING AND AWARENESS	Train employees on the BCP, this also raises awareness on the importance of BCP and will bring feedback to the BCP review.

7. Conclusions

Renewable offshore energy has been identified as the vital sector for decarbonization and energy independence of Europe and in this sense its resilience is of utmost importance to safeguard this industry.

Green Deal Industrial Plan that was proposed on EU level in 2023 aims to solve some of the critical challenges facing European clean high-tech industry , including renewable offshore energy. It represents a roadmap for new industrialization wave in Europe – the one where future EU industry will be based on net zero green house gas emissions that would require adjustment of industrial technology and process for production built on domestic (EU) sources of critical raw materials. A specific set of actions would be required to strengthen further the renewable energy supply chain in forms of direct financial support, tax credits and accelerated depreciation.

This report has investigated some of the key challenges to resilience of ORE sector in view of foreseen deployment of offshore energy to meet European clean energy targets by 2030 and 2050. The survey conducted with ELBE companies has showed that majority of them didn´t receive any specific support from EU/national/regional level during the COVID-19 pandemics and energy crisis. This represents a significant gap which should be adequality addressed within governmental support schemes as to improve ORE sector resilience in the event of future crisis. Furthermore, the survey showed that most of companies lack Business Continuity Plan in their organization as an important tool to cope with crisis events.

The report has outlined recommendations to strengthen resilience including elements for development of Business Continuity Plan that can be used by companies as reference material. Based on report findings, a consolidated support to strengthen European ORE sector resilience is needed on policy level with following measures:

- Introducing specifically designed and dedicated financial incentives and mechanism to support the critical projects in renewable offshore energy in Europe;
- Increasing public investments in R&D of new materials, products and processes that can enable predictive and mass scale development of renewable offshore energy projects;
- Strengthening cluster collaboration via European support networks is of vital importance for diversification of the suppliers and value chain of ORE sector.

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