



Regional Policies for Offshore Wind: A Guidebook



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**Responsible Partner:**

German Offshore Wind Energy Foundation
Oldenburger Str. 65, 26316 Varel, Germany
info@offshore-stiftung.de
www.offshore-stiftung.de

Consultant:

Dr. Kristina Koebe, Rotorwerk Project Services
Stephanstr. 17, 18055 Rostock, Germany
www.rotorwerk-project.de

Lead Partner 4POWER:

Province of Groningen
Sint Jansstraat 4, P.O. Box 610
9700 AP Groningen, Netherlands
www.provinciegroningen.nl

English copyediting:

Thomas Gardner, 3rdVision

Layout and illustrations:

Tobias Cordes, freeline

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List of Project Partners

Province of Groningen, Netherlands
www.provinciegroningen.nl

Province of Rimini, Italy
www.provincia.rimini.it

Sustainable Industries Institute, Dundee College, United Kingdom
dundeeandangus.ac.uk

Latvian Association of Local and Regional Governments, Latvia
www.lps.lv

Rostock Business and Technology Development GmbH, Germany
www.rostock-business.de

Maritime Institute in Gdańsk, Poland
www.im.gda.pl

AZORINA - Society for Environment Management and Nature Conservation, Portugal
parquesnaturais.azores.gov.pt

Malta Intelligent Energy Management Agency, Malta
www.miema.org

City of Emden, Germany
www.homeport.emden.de

German Offshore Wind Energy Foundation, Germany
www.offshore-stiftung.de

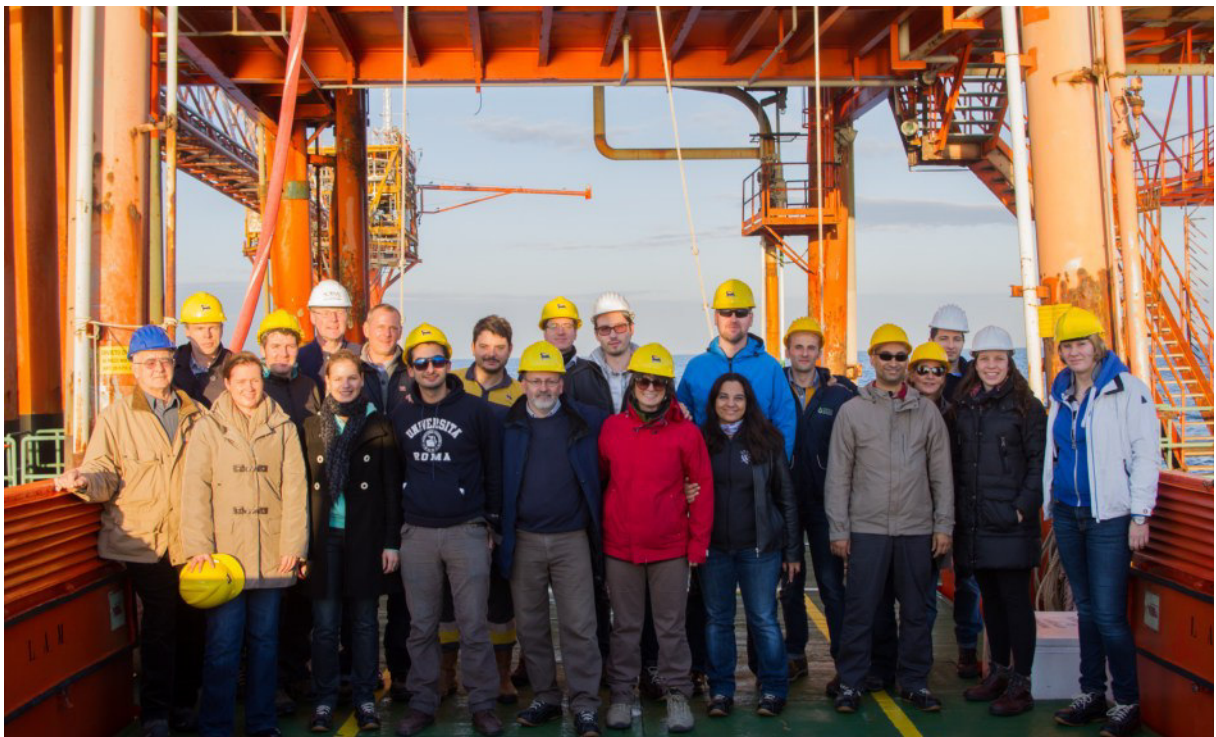


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Introduction

This document aims to be a guidebook for regional authorities and agencies that are considering whether to support the development of offshore wind energy in their region. It presents an overview of the experiences gained from the 4POWER project.


In the 4 POWER project, experts from ten regions of nine EU Member States engaged in an intensive dialogue on the regional policy dimension of offshore wind development. The experts came from a variety of organisations, including regional government, regional economic development agencies, research institutions and the German Offshore Wind Energy Foundation.

The partners of the 4 POWER project are the Province of Groningen (Netherlands), the Province of Rimini (Italy), the Sustainable Industries Institute at Dundee College (Scotland, UK), the Latvian Association of Local and Regional Governments, the Rostock Business and Technology Development GmbH (Germany), the Maritime Institute in Gdańsk (Poland), the Azorina Society for Environment Management and Nature Conservation (Portugal),

the Municipality of Corfu (Greece), the Malta Intelligent Energy Management Agency, the City of Emden (Germany) and the German Offshore Wind Energy Foundation.

Some of the participants come from countries and regions with significant offshore wind experience, others from countries and regions that are still undergoing preliminary studies. Bringing together these two perspectives turned out to be very valuable. The regions at an early stage of offshore wind development gained many useful insights, which could save them from attempting to reinvent the wheel. The regions with more offshore wind experience exchange views with colleagues who have a strong background in regional economic development, but might currently be looking at offshore wind with a fresh pair of eyes, which may help to question some accepted wisdoms.

The present guidelines have emerged from a complex process, mainly conceived to foster mutual learning among the project's participants. In a first step, the status quo in the different

A photograph of several offshore wind turbines in the ocean. The turbines are white with red-tipped blades and yellow bases. They are spaced out across the horizon under a blue sky with scattered white clouds. The water is dark blue with some white foam from waves in the foreground.

partner regions was analysed to identify strengths and weaknesses, common challenges and interesting approaches. Based on this analysis, the consortium partners identified a broad set of elements of good practice. In the following phase, each project partner considered the (un)suitability of each of the identified good practice elements, looking at the specific conditions of its own region. On this basis, the number of good practice elements was reduced, and their categorisation strengthened. After this process of filtering, the project team developed the selected recommendations presented in this report.

Thus, these recommendations do not claim to include all relevant experiences from every European country, but simply reflect the shared experience of the regions involved in this project. We hope that they can be useful for other regions in Europe, and perhaps on other continents as well.

Further information and documents are available on the project website www.4-power.eu. After the end of the project, the coordinator and the other

consortium partners remain at your disposal regarding any questions that may emerge from reading this document.

The present paper is mainly addressed to regional authorities and therefore focuses on those measures that can be undertaken at the regional level. The 4POWER project also elaborated a set of recommendations addressed to the EU level, published in a separate document called *EU and Regional Policies for Offshore Wind: Creating Synergies*.

While this document generally reflects the shared conclusions which emerged over the course of the project, not every view expressed in this report is necessarily endorsed by each of the project partners. Taking into account the institutional character of some of these partners, this would not have been possible. Thus, final responsibility lies with the authors of this document, the German Offshore Wind Energy Foundation and the 4POWER project.

Executive Summary

This document has been devised to help regional authorities and regional economic development agencies to prepare their regions for the future, with the goal of maximising the potential economic benefit from the large-scale deployment of offshore wind energy expected in the coming decades.

The key messages are:

- A large-scale deployment of offshore wind is expected in the coming years and decades, in many parts of Europe.
- This unlocks substantial opportunities for economic development in the regions where offshore wind is deployed, and in those regions able to establish offshore wind industry clusters.
- Regional authorities can take a number of (partly straightforward) measures which help to secure the economic benefits linked to offshore wind energy. This document offers an introduction to the design of these measures.

Chapter 1 discusses why offshore wind deployment is a public policy objective: security of energy supply, economic development, climate change mitigation, low impact on the regional environment. Offshore wind generates electricity more steadily and predictably than onshore wind. Compared to onshore renewables in general, offshore wind requires very little land use and often enjoys higher levels of acceptance. For these reasons, offshore wind is an essential component of any future power system based on high shares of renewable energies.

Chapter 2 illustrates the offshore wind deployment trends, based on European market statistics. It shows that offshore wind capacity has grown substantially during the past few years. Taking into account the most recent threats to Europe's security of supply, the worrying news about climate change, and the more encouraging prospect of a considerable cost reduction potential for offshore wind, the continuation of strong growth in the coming years is both desirable and likely.

Chapter 3 looks at the positive impact of offshore wind on economic development at regional level. A substantial share of the jobs related to offshore wind is inherently located in the regions of deployment. Other important shares can be found close to ports in other regions; a further portion of the supply chain can be delivered anywhere. Thus, from the point of view of regional economic development, the most important objective is the promotion of deployment in the own region. The more ambitious goal is to facilitate the location of offshore wind industry clusters that also serve demand in other regions.

Chapter 4 represents the core of this document. It discusses in detail how regional authorities can increase the odds that they will benefit from the economic potential related to offshore wind, by contributing to the development of the necessary social and physical infrastructure in their region. It is divided into four sections, looking at the establishment of industrial clusters, the physical infrastructure, training and education, and awareness raising and acceptance, respectively.

At the beginning of each section, the key messages are summarised in a short and compact overview. Each section also features an analysis of the relevant issues, a clear description of concrete actions that regional authorities can undertake to facilitate offshore wind deployment, and some good practice examples.

1. Why offshore wind

Offshore wind deployment is instrumental in the achievement of a number of public policy goals. Security of energy supply, climate change mitigation and economic development belong to the most urgent. To create an economically and environmentally sustainable supply system based on domestic European resources, Europe needs to put into place a strong mix of renewable energy sources and energy efficiency measures. Within this mix, offshore wind will play a major role in the long term, due to its specific advantages: a low level of land use, a low impact on people and environment, and a comparably steady and predictable generation profile.

Security of supply: The EU imports most of the energy it consumes. In 2012, import shares were 98% of the EU's uranium consumption (Euratom 2013), 86% of oil, 66% of gas and 42% of solid fuels (Eurostat database). Reducing Europe's dependency on energy imports is a top priority of EU energy policy making. Offshore wind can substantially help to achieve this goal. Under ideal conditions, 150 GW offshore wind capacity could be in operation in European waters in the next 20 years. In an average wind year, this would produce approximately 562 TWh of electricity (EWEA 2011), equal to 14% of the EU's electricity demands. The total offshore wind potential is much larger. According to a 2009 study by the European Environment Agency, the technical potential of offshore wind in Europe is seven times higher than Europe's electricity demand. After excluding offshore wind projects in areas constrained by environmental regulations and other restrictions, the offshore wind potential is still a remarkable 80% of total EU electricity demand (EEA 2009). Together with other renewables, offshore wind can power Europe with 100% clean, indigenous, renewable, and limitless energy.

In the long-term, security of supply can only be guaranteed by a strong mix of energy efficiency measures and sustainable renewable energy production. Even if domestic shale gas or coal production would be expanded, these resources will one day be depleted, but the resulting damage to the local environment and the global climate will remain.

Economic development: Currently, Europe's industry is indisputably the global leader in offshore wind energy. According to data from Deloitte, total employment in the EU wind energy sector (onshore and offshore) was 238,000 in 2010; moreover, "offshore wind energy is between 2.5 and three times more labour intensive than onshore wind energy" (EWEA 2012). Unlike other sectors, the wind energy industry is planning to expand its highly skilled employment base: nearly 50,000 additional trained staff will be needed in the wind energy sector (onshore and offshore) by 2030 (EWEA 2013a). Jobs in installation and O&M in the offshore sector are on average better paid. Most of the turnover related to offshore wind energy remains within the European economy. Furthermore, maintaining Europe's leadership will provide substantial export opportunities for the European economy as a whole. Significant employment effects can occur, especially in the regions where offshore wind is deployed.

Climate change mitigation: Offshore wind turbines produce no emissions in their operation and have an extremely low life-cycle climate balance (Wagner 2010). According to the low-carbon economy roadmap of the European Commission, all scenarios compatible with reducing climate change to a manageable level require an almost complete decarbonisation of the power sector by 2050 (Comm 2011a). Energy efficiency and renewables are the no-regrets options to decarbonise the power sector, according to the Energy Roadmap 2050 of the European Commission (Comm 2011b). Therefore, regardless of the scenario one considers more likely, a large-scale deployment of both

energy efficiency measures and renewables is in any case necessary. The alternative options for decarbonising the power sector would be nuclear energy and CCS (carbon capture and sequestration). Since the Commission published the two roadmaps mentioned above, the prospects for deployment of nuclear and CCS in Europe have declined (WNISR 2013, Global CCS 2014). Thus, the urgency of achieving high shares of renewables in the power sector in order to tackle climate change has further increased.

Low impact on regional environment: Unlike offshore oil and gas (OSPAR 2009), offshore wind farms produce bulk amounts of energy with a very low environmental impact (Wagner 2010). Increased understanding of the environmental context and careful siting can further minimise this impact. Positive effects on local marine biodiversity have been observed (Lindeboom 2011, Wilhelmsson 2010). The industry is working hard to reduce the acoustic impact on marine life during construction.

Land use: Some European countries with high offshore wind potential are among the most densely populated in the world. Offshore wind facilitates large-scale renewable energy deployment with extremely low levels of land use.

Acceptance: In general, offshore wind deployment has a very low impact on the public. Usually, the concerns centre mainly on the visual impacts of the turbines, especially if built close to shore. However, empirical studies show that, even in touristic areas, once projects are completed, acceptance increases (Albrecht 2013). Dealing with acceptance issues implies comparing alternatives. The transition to renewables enjoys broad acceptance. A number of surveys (for instance Eurobarometer 2011, Eurobarometer 2014) have shown that an overwhelming majority of Europeans is in favour of increasing the use of renewables, more than any other energy sources. However, at a certain level of deployment, the acceptance for further onshore wind farms, biogas plants or other facilities can decline. In some regions, this trend can already be observed, even in countries where renewable energies enjoy particularly high public support, like for instance Denmark and Germany. Thanks to its generally low impact on people, and to very low levels of land usage, offshore wind provides the opportunity to achieve higher shares of renewables with fewer acceptance problems.

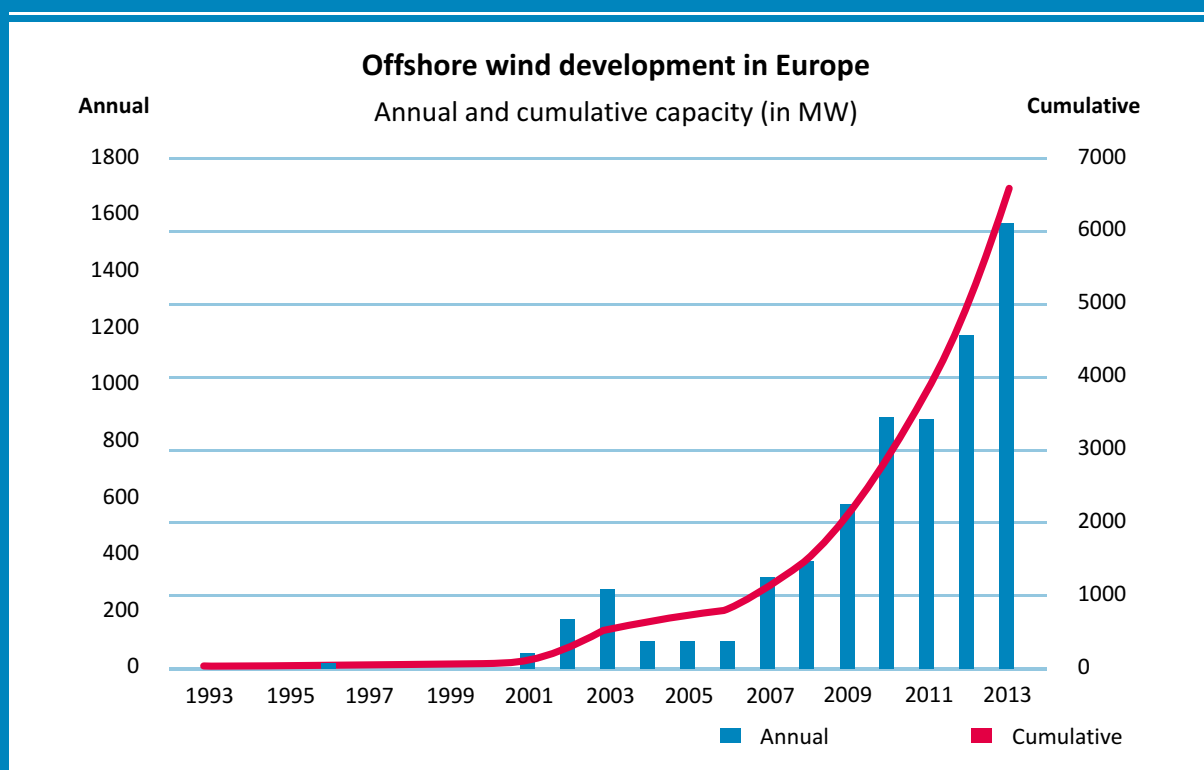
More constant and predictable generation: In a power system with high shares of renewables, offshore wind energy will play an essential role due to its specific strengths. With high shares of wind and solar energy, the power sector of the future will have to cope with a high degree of variability in generation. This challenge is manageable, but it comes with certain costs and adaption requirements. Offshore wind helps mitigate the challenge, since its generation profile is significantly more constant and predictable than onshore wind and solar PV (IWES 2013). Offshore wind increases the firm capacity deliverable by the renewable energy portfolio, and reduces the need for reserve generation capacities.

2. Offshore wind at the threshold to large-scale deployment

Offshore wind energy is a young and emerging, though very rapidly developing technology, at the threshold to large-scale deployment.

The first test turbines in the sea were installed in the 1990s. By the end of 2013, 2,080 turbines were operating in European waters. During 2013 alone, 522 new turbines were erected, an average installation of 4.3 MW per day.

The cumulative offshore wind capacity connected to the grid in Europe amounted to only 36 MW in 2000, multiplied to 712 MW in 2005, 2,956 MW in 2010 and 6,562 MW by the end of 2013. Furthermore, at this time, approximately 3,000 MW more were under construction and around 22,000 MW had been consented (EWEA 2014).



Data source: EWEA (2014)

The cumulative European offshore wind fleet is likely to cross the 10,000 MW mark by 2015/2016 at the latest, which will be more than a twelvefold increase within one decade.

The European Wind Energy Association estimates that total annual investments in offshore wind farms lay between €4.6 billion and €6.4 billion in 2013 alone. This refers just to investment in wind farms and does not include investments regarding the supply chain, R&D, and infrastructure on land.

Taking into account the most recent climate and foreign policy developments, achieving the EU's 2020 target of 20% renewables would be the minimum necessary to deal with the challenges ahead. This will require a further massive increase of renewable energy production. Moreover, further targets for 2030 are in the process of being adopted, and Europe remains fully committed to its 2050 climate targets, which imply an almost full decarbonisation of the power sector.

Europe is the global leader

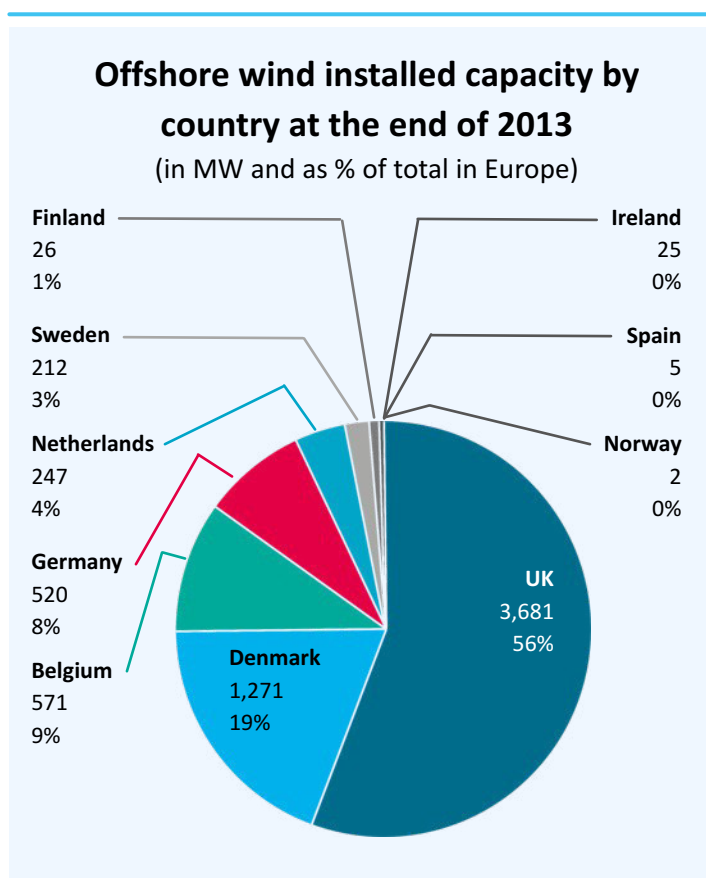
Europe is the global offshore wind leader. European manufacturers are internationally leading in most key technological areas, including offshore wind turbines, foundations, platforms, vessels and subsea cables. According to the Global Wind Energy Council, Europe was home to approximately 99% of the offshore wind capacities in operation in 2012. However, the potential for development is large also in other parts of the world. Large-scale projects are now being developed in North America and Asia. China has set itself a target of 5 GW offshore wind to be in operation by 2020. These trends will generate important export opportunities for the European offshore wind industry.

Geographical spread within Europe

The number of European countries actively involved in the offshore wind energy sector is increasing, with offshore turbines now operating in ten European countries, and others also producing components.

With its share of 56% of the European installed capacity at the end of 2013, the UK is by far the global leader in offshore wind. Together with Denmark and Belgium, 84% of the European offshore wind capacity currently in operation is concentrated in just three countries. However, with 2,325 MW under construction and a further 870 MW with firm investment commitments expected to come online by 2016, Germany is likely to become the second largest offshore wind energy producer in the near future (OffWEA database). However, this position might be challenged by France in a few years, which awarded tenders for 1,900 MW in 2012 and officially plans to build 6,000 MW by 2020. Additional capacities have also been approved in the Netherlands, Belgium, Sweden, Finland, Ireland, Estonia, Italy and Greece (EWEA 2014).

This chart shows the huge differences existing between European regions. So far, nearly all offshore wind development is concentrated in the North Sea, the Baltic Sea and the Irish Sea. However, there is also considerable offshore wind potential along Europe's Atlantic coast, as well as in the Black Sea and in the Mediterranean. Regarding the latter, wind resources in many areas may not be as strong as in the North Sea, but offshore wind energy is well-suited to compensate for the generation profile of solar energy, as the wind blows steadier and usually stronger during the winter.



Data source: EWEA (2014)

Larger, deeper and further

The technology and nature of offshore wind projects is evolving rapidly. The average capacity of an individual new offshore turbine increased from 2 MW in 2002, to currently about 4 MW. The average size of offshore wind projects increased from less than 100 MW during the last decade to 482 MW in 2013.

At the same time, offshore wind farms are being built progressively further from shore and in deeper waters. Most projects built to date are within 25 km from shore and at less than 25 meters water depth, whilst most of the projects currently approved are in deeper waters, in depths up to 40-50 meters, and much further from shore, at distances up to 100km (EWEA 2014).

Cost reduction prospects

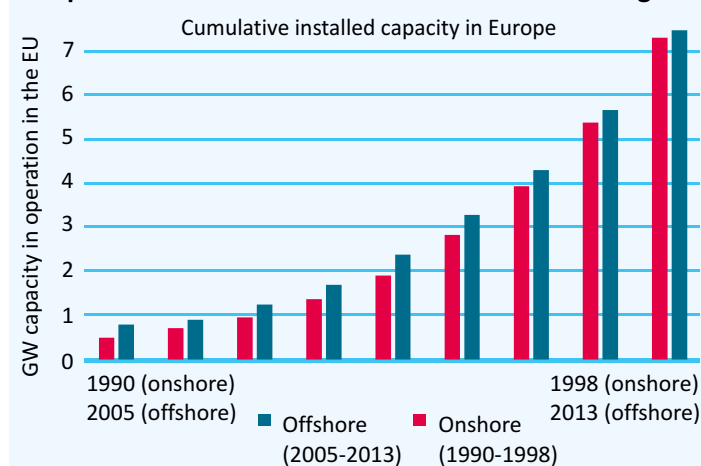
Currently, offshore wind has higher costs than other renewable energy sources, e.g. onshore wind and solar PV. However, offshore wind is a young technology that started industrial level development only a few years ago. The potential for cost reduction through economies of scale and technological learning-curve effects is larger than for other more mature RE technologies.

According to a detailed study on behalf of the German Offshore Wind Energy Foundation (Fichtner and Prognos 2013), the levelised cost of electricity from new offshore wind energy could decrease by 32% to 39% within the decade from 2013-2023. A study by The Crown Estate, the public agency that manages the property owned by the Crown of the United Kingdom, comes to similar conclusions: a cost reduction of 39% could be achievable within just nine years (TCE 2012). In both cases, the key prerequisite for achieving these reductions is the continued expansion of offshore wind farm deployment on a substantial level.

The chart below shows that offshore wind deployment during the last decade has followed a growth rhythm very similar to that of onshore wind 15 years earlier. During the 1990s, thanks to steady political support in some frontrunner countries, onshore wind experienced continuous growth, triggering large-scale investments throughout the value chain. These investments paved the way for the technological improvements and economies of scale that fuelled onshore wind's spectacular global growth since the beginning of this century. Today, more than 110 GW of onshore wind are in operation in the EU, covering 8% of the EU's electricity demand (EWEA 2014a). That is nearly 20 times more than in 1998, the last year shown in the chart below. Additionally, new onshore wind plants

located at good sites now produce electricity at a lower total cost than do new fossil fuel plants.

Comparison of historical offshore and onshore wind growth



Data source: EWEA

All this, combined with the expectations regarding cost reductions and the benefits specific to offshore wind, create highly promising prospects for massive deployment of offshore wind energy in many parts of Europe over the next decades. Regional authorities can prepare, in order to make the best possible use of this opportunity to foster economic development in their region.



3. Opportunities for regional economic development

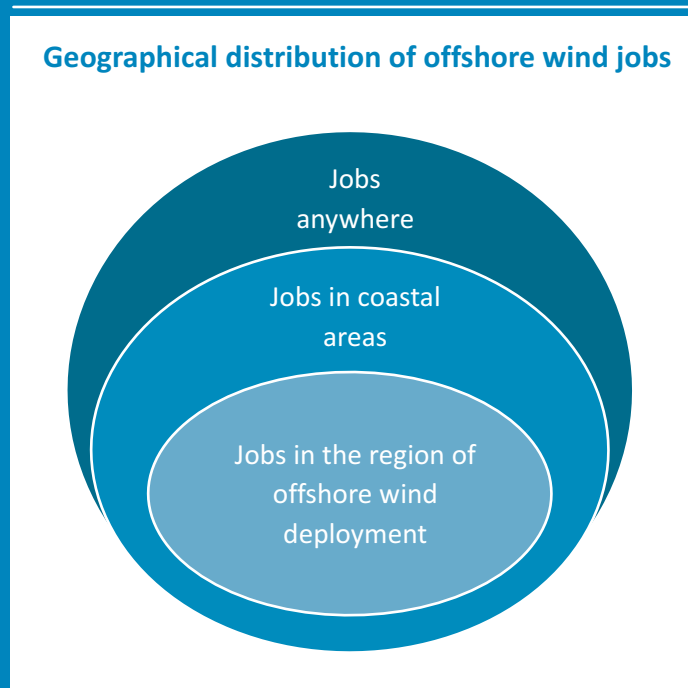
Like other renewable energies, offshore wind energy avoids depletion of finite fossil sources, and reduces the impact on climate and environment. On the other hand, it is more labour intensive when compared to conventional fuels.

This is an advantage for the regions where offshore wind is deployed: a significant part of the added value and employment opportunities are inherently located in these regions, including elements of project development work (sea floor and wind resource exploration, environmental impact assessment), nearly all the jobs related to pre-assembly of offshore wind components in the ports, and a large part of the jobs related to construction work of the offshore wind park. Once the offshore wind park is in operation, a large share of maintenance and repair activities are based in the region's ports, as will ultimately be the jobs related to decommissioning.

Furthermore, the deployment regions have excellent opportunities to become offshore wind industry clusters, also attracting a portion of the jobs that are not automatically located close to the offshore wind development sites. Certain activities, such as the manufacturing of marine equipment and the largest components, take place at, or very close to, the ports, but they can also be located in other regions. Manufacturing of smaller components, as well as the provision of certain services, can be located almost anywhere. For instance, in Germany, the states of North Rhine-Westphalia, Bavaria and Baden-Württemberg, although not located at the Baltic or North Sea, are among the federal states with the highest sector turnover and the highest number of jobs related to offshore wind energy (PwC/WAB 2012).

Looking at the project implementation process, the regions of deployment already start to benefit from employment effects during the phase of project development. Developing a typical offshore

wind farm of 300 MW usually requires 4-6 years before an investment decision can be made (Fichtner and Prognos 2013). However, the bulk of regional employment occurs during the construction phase. Some of this is inherently local, further relevant shares can be located in other coastal areas or elsewhere. The construction phase of an offshore wind farm typically lasts 24-72 months and creates thousands of jobs in the region. After construction, decreased, but constant employment levels remain for operation and maintenance of the offshore wind plants throughout an expected lifetime of twenty years, after which decommissioning and possibly repowering will follow.



Source: German Offshore Wind Energy Foundation

Regional employment effects in the offshore wind project development phase

	Project development	Construction	Operation	Decommissioning
Typical duration	48-72 months	24-48 months	20-25 years	12-24 months
Regional employment effect	Low	High	Medium	Medium

Data source: Fichtner and Prognos 2013

From the point of view of regional development, two goals related to offshore wind can be defined:

1. Supporting the development of offshore wind projects in the region, and their implementation. This has a substantial positive impact on regional employment, both in the short and in the long term.
2. Backing the establishment of industrial clusters of manufacturers and service providers in the region. This option can be pursued not only by regions with offshore wind deployment potential in their direct proximity. To a certain extent, offshore wind industrial clusters can also be established elsewhere in proximity to ports.

Clusters, or industrial clusters, are widely recognised as a motor of regional economic development (Comm 2003, Ketels 2003, ECU 2013, CEP 2013). Clusters are often long-lasting phenomena. Typically, they come into being during the early phases of development of a certain industry, or during phases of strong innovation. Once a cluster has been established, that region is likely to maintain the competitive advantage over a longer period of time.

As seen above, the offshore wind industry is currently experiencing very rapid development and innovation cycles. Industrial clusters are likely to be established during such a seminal phase. Given the high potential for development in the offshore wind sector in the long term, the leading industrial regions are likely to benefit over a long period.

Naturally, the two strategies are linked to each other: development and implementation of offshore wind projects are crucial factors for the creation of offshore wind clusters. On the other hand, the availability of a social, economic and physical infrastructure can encourage investment in offshore wind parks in that region.

4. What regions can do to realise the economic potential of offshore wind

This chapter outlines the key activities and policies that can be implemented at regional level to support the improvement of the physical (ports, roads) and social (training, clusters, acceptance and awareness raising) infrastructure that encourages the development of offshore wind in the region. It shows that regional authorities and economic players can indeed do a lot to attract offshore wind investments to their region.

However, it must first be acknowledged that the most important determinants for offshore wind development are not set at the regional level, but rather at the national and the EU levels. This framework of regulations and conditions includes the long term energy and climate policy targets and visions, power system governance, electricity market design, the support schemes for renewable electricity investments, the rules concerning grid connection of offshore wind farms as well as the general procedures for electricity grid planning and, to a large extent, maritime spatial planning. These areas of EU level competence are discussed in the document EU and Regional Policies for Offshore Wind: Creating Synergies, also produced in the context of the 4POWER project.

However, regional authorities and stakeholders can play an important role, going beyond the strict scope of their statutory responsibilities by engaging in the national and EU policy-making processes. Some regions and actors have already made significant economic and political investments to pave the way for offshore wind development, counting on the stability of a favourable national and EU level framework for offshore wind deployment. If this framework is threatened, the regional governments and stakeholders have a legitimate interest that their investments will not be stranded. Furthermore, regions with large, but thus far not yet implemented offshore wind deployment potential have an objective interest to be given the chance to realise their regional economic development potential in this field.

In some countries, regional authorities have a strong, direct procedural influence on national policy making, and, at least indirectly, on EU policy making. In other countries, the formal powers of regional authorities are more limited. However, it is also possible in these latter countries for regions to become vocal and participate in the national and EU policy debate.

Supporting the establishment of offshore wind industry clusters

What	Establishment of an entire supply chain within the own region.
Who	Regional economic development agency.
How	Promote pilot offshore wind projects; build a strong regional offshore wind network; entice global market leaders to locate in the region; assist local businesses entering the offshore wind market; back the implementation of international standards.

The previous chapters have outlined the practical options that regional authorities have to help create the physical (ports, roads) as well as the social (awareness, acceptance, training) infrastructure to facilitate the deployment of offshore wind projects in their region. The first objective is usually to promote the development, construction and operation of offshore wind plants, which unquestionably has a positive impact on regional employment, both in the short and in the long term.

However, from the standpoint of regional economic development, it is even more interesting to promote the establishment of clusters in the region, e.g. drawing in offshore wind turbine and component manufacturers and service providers. These could potentially also supply their products or services to offshore wind parks built in other regions or countries. In the best case hosting the entire value chain, the region becomes a net exporter of products and services related to offshore wind.

Considering the promising prospects for offshore wind deployment at global level in the medium and long term, the establishment of a region as an offshore wind industry cluster creates very good opportunities for a sustainable economic development. As mentioned above, industrial clusters are widely recognised as engines for regional economic development (Comm 2003, Ketels 2003, ECU 2013, CEP 2013). Clusters are often enduring phenomena. Typically, they come into being during the early phases of development of a certain industry, or during phases of strong innovation. Once a cluster has been established, that region is likely to maintain the competitive advantage over a longer period of time.

Regions with existing offshore wind deployment potential in their direct proximity can be in the privileged position of early movers. However, the offshore wind energy sector is still at an early phase of development, and thus newcomer regions still have the potential to become important players. To a certain extent, industrial clusters specialised on the design and manufacture of components for offshore wind can emerge independently and relatively far away from the location of future offshore wind parks.



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What regional authorities can do in practice

Promote pilot offshore projects: Without at least some offshore wind deployment in the vicinity, it is difficult to establish a supply chain in the region. Therefore, attracting investment for an initial offshore wind plant is crucial. The first step is the hardest: the experience in the frontrunner countries shows that once the first infrastructure has been established in a region, the subsequent projects become easier. In the UK and in some German regions, where offshore wind deployment has been ongoing for several years, all elements of the supply chain are present.

Build up a strong local/regional offshore wind network: The establishment of an industrial cluster is facilitated if companies involved in the various parts of the supply chain organise into a well-structured network. This can facilitate cooperation and joint strategic planning on shared regional issues, including those mentioned in the following chapters, but, for instance, can also bring forward maritime and land-based spatial planning. Such industrial networks may arise spontaneously, but proactive support from the regional government or a regional/economic public development agency may be instrumental in enabling their creation, acting as a catalyst during the more difficult initial phase. The start-up costs for such networks are modest, and EU funding may be available in certain regions. Once the network is established, membership fees can cover a large part of the costs, although it may be useful for the regional government to stay on board and help to maintain a spirit of collaboration among what might be competitors, in the best interests of regional economic development.

Entice global market leaders to locate in the region, to foster cooperation with local players and strengthen the learning effect.

Support local businesses entering the offshore wind market: Especially companies with previous experience in related sectors (e.g. onshore wind, other maritime operations), but also newcomers with innovative business models, can have good opportunities to find their niche in the rapidly evolving offshore wind energy sector. Regardless of the investments necessary for one offshore wind park, SMEs can play a part in offshore wind projects if they develop a good working relationship with project developers, turbine manufacturers or other actors in the offshore wind value chain.

Favour the implementation of international standards, regarding technology, health and safety related issues, and others. The offshore wind energy sector is developing into a global market. Solo attempts or protectionist approaches are likely to backfire.

Good practice examples

One of the guiding examples for all related 4POWER activities was the WindEnergy Network, which was established in the Rostock region on the German Baltic coast already in 2005, motivated by the development of offshore wind farm Baltic 1. Companies like Wind Project, Siemens, Nordex and Aker Yards joined forces to bring the initiative forward. They searched for a neutral partner, able to organize meetings, bundle interests and design a joint marketing strategy – and found it in Rostock Business, the city's business development agency. In 2009, the network widened its horizons by integrating onshore wind energy companies. In 2013, the network consisted of around 100 companies covering the complete onshore and offshore value chain – from planning and consulting to building, construction and operation.

The Rostock network, and similar structures in Emden on the German North Sea coast (Homeport Emden 2014), in Scotland (Offshore Wind Scotland 2014) and the Netherlands (Northern Netherlands

Offshore Wind, NNOW 2014), organise networking activities, support their members and attract investments to the offshore wind energy clusters in the respective regions, for instance by participating in sector-related events, such as international fairs and conferences. During consultations with the network coordinators who took up their work in the context of the 4POWER project, the coordinators indicated that building such a network required an initial investment to finance manpower and activities. Once operations have started, it can become increasingly self-sustaining, as the members see the added value of being part of the network.

In Poland, the establishment of a network inspired by such best practices has been a focus of the work of the Polish Offshore Wind Energy Society over the last years – although, due to the less advanced stage of offshore wind energy development in Poland and the lack of political support for offshore wind energy use, the network so far works mainly on raising awareness. Still, another important objective is, and has always been, to involve Polish companies into offshore wind energy projects, in Poland or in other countries. Recently, influenced also by the exchange of experience within the 4POWER project, there has been a clear focus on offshore wind energy in light of its significant potentials for the national economy and labour market. Contacts between large manufacturers and suppliers have been established within the network, and ongoing exchanges between them are enabled via regular meetings and joint events.

In Latvia, the exchange of experience between the 4POWER project partners resulted in the decision to consolidate the efforts of several existing renewable energy networks. Consequently, the Latvian Federation of Renewable Energy Sources (LAEF) and Latvian Wind Energy Association (LWEA) merged and now work jointly on modernising the Latvian legal system for the benefit of future RES projects.

One significant effect of the 4POWER project was the creation of links between two regional clusters for the benefit of both parties: Within the context of the international conference “Wind & Maritime” in Rostock, a match-making between business and policy representatives from Groningen and Rostock was arranged, and resulted in several concrete cooperation projects.

Physical infrastructure (ports and roads)

What	Support the adaptation of physical infrastructure to the requirements of offshore wind deployment.
Who	Local and regional authorities, in collaboration with port operators and other entities operating relevant transport infrastructure. Co-financing from state/national and European funds possible.
How	Analyse suitability of existing infrastructure for the envisaged offshore wind deployment; promote coordination of port operators to achieve coherent investment plans in the region; provide direct financial support if needed and/or facilitate the acquisition of national or European funds; provide information on existing and planned infrastructure on transparent online platforms.

Importance of ports and transport infrastructure

Ports play a crucial role for the offshore wind value chain. Every component of an offshore wind farm has to be delivered via ship, and some of these are extremely large and heavy. Furthermore, many

components and parts are produced, partially preassembled or temporarily stored in port areas, or in their vicinity. Finally, ports are the logistics bases for site exploration during project development, for O&M and for decommissioning activities.

Therefore, the availability of suitable ports and transport infrastructure (roads, railways, if relevant, intermodal logistics centres, as well as airports) can be a critical factor in the competition among regions to attract investments and jobs in the offshore wind supply chain.

Classification of offshore wind ports

The suitability of the infrastructure is therefore an important precondition for offshore wind deployment. According to the port atlas produced by the Association of German Seaport Operators (ZDS 2013), offshore wind ports can be classified into three main categories: major component ports, service and maintenance ports, and research and test ports.

Major component ports, are those with the most notable requirements in terms of infrastructure. There are several subcategories according to function (several of which can be served by the same port):

Production ports either host, or are very close to, manufacturing sites of major offshore wind components, such as tower segments, nacelles, rotor blades, fundamentals, sea cables and others. A production port must have the capacity to handle the storage and transport of the respective components. Depending on their size, some components can be transported over long distance. In this case, the production port must not necessarily be close to the offshore wind plants under construction.

Installation ports host the preassembly of the offshore wind turbines, with significant benefit for the region in terms of jobs creation. They require sufficient assembly areas, heavy duty storage capacities, sufficient water depth, sufficient manoeuvring space for installer ships, and good hinterland connections (road, railway and inland navigation for heavy load transportation). Installation ports need to be relatively close to the offshore wind farm sites.

Ports of refuge offer refuge for ships engaged in offshore wind farm construction or O&M. Proximity to the offshore wind farm site is key. They require sufficient areas of protected water.

In transshipment ports, offshore wind energy components are loaded/unloaded on their way from manufacturing to assembly site. Such ports are logistics centres. The main requirement are sufficient storage areas and transport infrastructure.

Service ports function as basis for the operation and maintenance of the offshore wind plants. Proximity to the site is a key factor. Storage and loading of small and large components must be possible. At installation ports, an offshore wind plant generates high economic activity over a relatively short period of time. O&M activities are smaller, but they last for many years.

Research and test ports host R&D, test and training facilities for the offshore wind sector. These facilities typically attract highly-skilled labour and create further development opportunities for the region. The infrastructural preconditions can be limited, depending on the specific activities to be hosted.

Requirements and experiences for offshore wind ports are described and analysed in sources from various countries (see for instance LCWG 2011, SEHIE 2010, SEIA 2011, SOW 2013).

The adaptation of port infrastructure can require significant investment. For instance, in the German port of Cuxhaven €125 million have been invested, and €24 million in Sassnitz. More than €200 million are planned for the expansion of the offshore terminal in Bremerhaven. At Emden's huge port development area "Rysumer Nacken" a multi-purpose/offshore-terminal is planned. The costs will also be about €200 million.

What regional authorities can do in practice

Regional authorities can promote the activation and coordination of port operators and other regional players (like road planning authorities) active in their region, as several 4POWER partner regions, like e.g. Groningen, Dundee, Emden and Rostock, have shown. Relevant steps can be:

- A detailed and realistic analysis of the prospects for offshore wind deployment in the region, in collaboration with offshore wind developers and industry.
- An evaluation of the suitability of existing port and other transport facilities for the projected short- and long-term offshore wind deployment, including an analysis of ports in neighbouring regions.
- Promote the coordination of the adaptation of ports in order to offer a sufficient and well-coordinated infrastructure, enable the construction of offshore wind plants and attract manufacturing and pre-assembling processes to the location.
- Consider providing direct financial support for the necessary infrastructure investments, possibly co-financing from national or European regional development funds, or to promote the creation of public-private partnerships with relevant economic actors from the region or from the offshore wind industry.
- Create online platforms providing information on existing and planned regional physical infrastructure for offshore wind.

While preserving competition between port operators may be important, a certain degree of coordinated infrastructure planning among port operators of a certain region may support an optimisation of the logistics chain and a reduction of the total costs of offshore wind power, which makes it easier to achieve climate and energy policy goals at lower costs. Furthermore, a good coordination of regional port development for offshore wind increases the region's chances to attract investment in offshore wind logistics and manufacturing facilities (SOW 2013).

Good practice example

An initiative that was considered to be very inspiring by the 4POWER team is the Scottish Renewable Infrastructure Plan (N-RIP 2009) developed on request of the Scottish government, and the regional public agencies Scottish Enterprise and Highlands and Islands Enterprise, with the aim to assist in the development of a globally competitive offshore renewables industry in Scotland. It analyses the expected offshore wind development according to UK national policy goals and plans. On this basis, it assesses the potential demand for port and other infrastructure, with the ambition of serving from Scottish ports not only the offshore wind developments planned in proximity of the Scottish coast, but also the very large developments planned for the long term. Then, the N-RIP outlines the infrastructure requirements for different categories of ports and it identifies twelve Scottish ports that already can fulfil, or can be adapted to fulfil, one or more of these functions, as well as a roadmap to develop investment plans in order to implement the desired infrastructure.





The Scottish N-RIP encouraged several port operators and local authorities to develop their own strategy to adapt their infrastructure, and to approach the offshore wind industry with the aim of attracting manufacturing, assembly and logistics activities to locate at their port. For instance, the city of Dundee set up a specialised team to attract investment for the booming renewable energy sector: Dundee Renewables.

Inspired by this best practice example, identified within the context of the 4POWER project, the project partners from Groningen set off two promising initiatives: The development of a heliport site and the development of an offshore wind test site, both located near Eemshaven. For the work on these site developments, as well as on overall harbour development in Eemshaven during the 4POWER project period, the exchange with the port of Emden, Germany's third largest and westernmost North Sea port that scores highly with its existing huge port development areas and many years' experience in the wind energy sector, was extremely useful. In Emden, components for both onshore and offshore wind systems are produced, assembled and shipped. The port owners have contributed by planning the expansion of ports, the fitting for heavy loads and the purchase of areas. The port operators are responsible for providing equipment able to lift heavy loads and the needed skills for operating the facilities.

In the state of Mecklenburg-Vorpommern, the 4POWER project's recommendation for an overall regional strategy resulted in a more intensive coordination of infrastructure planning and development activities related to offshore wind energy, visible, for instance, in a position paper issued by the regional WindEnergy Network. It is guided by the motto "One state – one harbor" and expresses, very much in agreement with what is recommended by the 4POWER best practices and guidelines, the need for a joint harbor strategy. The position paper indicates clearly how all larger ports in the state could mutually benefit from such a coordinated approach.

As Poland is one of the countries where offshore wind is still in its initial stages, the project 4POWER achieved a wider understanding that a joint strategy regarding offshore wind energy is needed which had to involve both larger and smaller ports. The project partners from Gdansk were able to convey



the message that a port study on this subject should be undertaken soon to make optimum use of existing offshore wind potentials, benefitting the local companies and the Polish labour market as well.

Based on the information gathered and evaluated in the context of the 4POWER project, the Azores islands determined that, in view of the current infrastructure and the islands' socio-economic status, a future focus will likely be on the service port function. Furthermore, a discussion on establishing energy storage solutions that allow an integration of offshore wind energy into the regional electric grid was started. Here it has to be stressed that the geographical conditions on the Azores do not allow economically viable grid connections to the mainland or even between the islands of the archipelago, so that long-term scenarios have to be developed.

In Italy, currently in the initial stage of offshore wind energy development, the construction of at least one pilot turbine was identified as a top priority for the region within the 4POWER project. This would open perspectives, build confidence and attract the necessary investments from private industry and governments, as well attract attention from a broader public. For these reasons, the Province of Rimini, in cooperation with ENI and supported by the enterprise Energia 2020, started an offshore wind monitoring campaign on the Azalea Platform B, located 12 km off of Rimini's shore. This initiative was conceived in view of the area's most important infrastructure, such as the ports of Ravenna and Ancona and the regional road infrastructure. In addition, the infrastructure connecting the gas platforms with the coast is present and could be exploited with regard to future offshore wind farms.

Following this path, a consistent short-term policy has been drafted to pave the way for the construction of a first pilot offshore wind farm which is able to meet the aforementioned expectations. The lesson learned from 4POWER has pushed the Province of Rimini to continue in the pursuit of this initial goal. The first analysis of the collected data confirms that the area involved is in class II, and some enterprises are still working on a preliminary project. On the basis of the monitoring results, the Province is also working on a technical and economic feasibility study in order to identify the best technology available that is suitable to the specific wind conditions and sea bed of the Adriatic coast.

The best practices described above, as well as the positive developments deriving from the 4POWER project, show that a regional/national inventory on the available supply chain elements and the existing port functions in the relevant offshore region enables an optimum strategic infrastructure development. Such infrastructure investments could not have been implemented without public funding, which may include regional, national and EU funds. Thanks to these investments, the northern German regions and Scotland were able to attract wind turbine manufacturers and related businesses, boosting regional economic development and laying the ground for a potential large-scale deployment of clean offshore wind energy.

Raising awareness and acceptance

What	Promote local backing and acceptance for offshore wind deployment.
Who	Regional authorities, in collaboration with offshore wind industry, project developers and local NGOs.
How	Fact-based information, full transparency and participation, integration of offshore wind with touristic offers, support for industry to locate in the region.

Unlike offshore oil and gas (OSPAR 2009) as well as onshore fossil and nuclear facilities, offshore wind plants produce bulk amounts of energy with a very low environmental impact (Wagner 2010). What impact there is, is mainly due to production of the steel contained in the turbines. During operation, offshore wind farms do not emit toxic or environmentally damaging substances, nor do they pose any danger to the health of the population. Their acoustic emissions are usually not perceptible from shore. Overall, offshore wind has a lower direct impact on people than do most other electricity generation technologies. This is one of its main advantages.

More generally, the transition to renewables enjoys broad acceptance. A number of surveys (for instance Eurobarometer 2011, Eurobarometer 2014) have shown that an overwhelming majority of Europeans is in favour of increasing the use of renewables, more than any other energy source.

Nevertheless, public acceptance may become an issue. In the case of offshore wind, a NIMBY (not in my backyard) attitude translates into “not along our coastline”. Regional authorities can do a lot to alleviate these problems by disseminating fact-based information and supporting the establishment of measures that maximise the positive impacts of offshore wind.

The nature of the existing concerns, and the solutions

The main reasons for local concern about planned offshore wind deployment regard its visual impact, potentially affecting tourism, and, to a lower extent, fears about the effect on fishery and the local marine environment.

Concerns about the visual impact are more relevant in the case of near-shore wind farms that are visible from land. Some countries go as far as to deny permission for any offshore wind plant visible from shore. As the hub height of modern offshore turbines can be around 100 meters, this can imply prohibiting offshore wind deployment closer than 20 km from shore.

If not buried in the ground, subsea cables connecting offshore wind farms to shore would be visible at the point of landing. However this is usually not a major issue, as the impact is very limited in size. In case of DC cables, the transforming stations are larger, but their impact is easier to manage as they can be located inland, far from more sensitive coastal areas. Finally, upgrades or extensions of the transmission grid on land may become necessary.

In reality, experience shows that these concerns are often not substantiated. “Several representative studies have revealed the assumption that tourism will suffer due to offshore wind farms to be more of a subjective fear than a measurable fact” (Albrecht 2013). As a matter of fact, offshore wind farms can function as an additional tourist attraction, as demonstrated by the good practice examples in this section.

As for the impact of marine life, it is arguably much lower than the impact of offshore oil and gas extraction facilities (see OSPAR 2009 and Wagner 2010). Increasing the understanding of the environmental context, together with careful siting, can further minimise the impact. Positive effects on local marine biodiversity have been observed (Lindeboom 2011, Wilhelmsson 2010). The industry is working to reduce the acoustic impact on marine life during construction.

In the context of the 4POWER project, experts from different countries reported that concerns about offshore wind are particularly high during the project planning stage, but tend to decline once the offshore wind farms are operating. Communicating the experience of other regions may help to alleviate these fears. The offshore wind industry is convinced that acceptance problems are based on



prejudices rather than facts. Therefore, it welcomes empirical, fact-based research on the real impacts of offshore wind on people and different economic activities.

Responsibility and role of regional authorities

Renewables are crucial to tackle urgent problems on a global, continental and national scale, such as security of energy supply and climate change. Therefore, a significant share of the responsibility to create acceptance for offshore wind and other renewable energy infrastructure lies with the national and European political levels, which can contribute by setting clear targets and coherently implementing these.

However, specific acceptance issues can and must be addressed mainly at the local and regional levels. Once the need to attain increasing amounts of renewables is acknowledged, the logical consequence is the necessity to deploy a reasonable mix of sources like wind, solar, biomass, hydropower, and geothermal. In many countries, wind resources, both onshore and offshore, are concentrated in coastal regions, which therefore are predestined to become centres of clean electricity generation. Regional authorities have the responsibility to promote public acceptance for wind energy in general. This notwithstanding, an offshore wind turbine can produce twice or three times the electricity of a comparable onshore turbine, whilst the visual and acoustic impact on people is generally lower. Offshore wind produces electricity with very low levels of land use.

Tackling acceptance issues requires close collaboration between public and private actors. The project developers and the offshore wind industry need to proactively contribute their know-how, but also expect to dedicate resources and time to interact with the local communities and take their concerns and proposals seriously. At the same time, an active involvement of regional and local public authorities is very helpful to provide the necessary objectivity and credibility to the information, and also as a visible sign of the positive economic effects of offshore wind deployment for the whole region.

Therefore, regional authorities should work proactively to stimulate acceptance for offshore wind projects, in collaboration with offshore wind developers, tourism promotion agencies and local NGOs. The use of existing networks, partnerships and structures can create synergies and be highly beneficial. Combining activities with existing attractions or touristic promotion activities can facilitate long-term sponsoring by public authorities or companies, support the recruitment of motivated and skilled staff and limit marketing and operational costs.

What regional authorities can do in practice

Positive experiences have been made with activities to increase understanding and acceptance for offshore wind among the local population in several coastal areas of Denmark, Germany, Sweden and of the United Kingdom (Albrecht 2013).

- **Provide fact-based information** about offshore wind, its side effects and impacts, including pros and cons. Pro and anti-offshore wind groups, in all countries investigated, share the opinion that they know too little about offshore wind energy and the related challenges and opportunities. Experience shows that concerns diminish once the turbines are operating. Therefore, it is very important to draw on the experience of the population in regions that are already familiar with offshore wind deployment, including those from other countries. This information should also include a clear presentation of the funding principles for offshore wind projects, as many prejudices are related to this field: as discussed above, the regions where offshore wind is deployed always benefit in economic terms, since the costs are shared at national level.
- **Ensure full transparency and participation:** During project planning, local and regional communities should be given access to fully transparent information, and have a real chance to participate. This helps overcome prejudices, avoid rumours, and ensure broad acceptance and enforceability once permitting has been awarded.
- **Highlight the tourist attraction potential of offshore wind:** The range of potentially entertaining offshore tourist attractions is large, e.g. onshore or offshore information centres and exhibitions, observation platforms with telescopes, guided boat tours, and helicopter flights around offshore wind farms. Moreover, specially designated areas for divers and sailors benefit from the reef effect produced by the wind turbines and from the prohibition of commercial shipping routes in the proximity of offshore wind farms. Offshore restaurants and merchandising products can round off the list.
- **Support related industries to locate in the region:** As discussed in the section on industrial clusters (see above), the arrival of offshore wind related businesses fosters acceptance by increasing local economic benefits, such as improvements in infrastructure, as well as direct and indirect employment opportunities.
- **Highlight local benefits and compensation:** If compatible with the national legal framework, it can be beneficial to foresee adequate compensation schemes for the usually small number of individuals or communities that may be adversely affected by offshore wind deployment to a significant degree, for instance in form of tax benefits, royalties, or other measures.

Good practice example

As an example for the provision of fact-based information recommended above, the German 4POWER partner from Rostock developed a tool that was praised by many other project partners: The first permanent exhibition about offshore wind energy in Germany, inaugurated in Rostock in April 2013. The exhibition focuses on presenting extensive information about offshore wind energy, project development, licensing, foundations and sea cables, including a visualisation of an offshore wind farm and an installation ship model, but also audio-visual presentations and interactive exhibits, models of offshore turbines and vessels, a touch-screen terminal, job descriptions and a quiz. Furthermore, it presents the most recent offshore wind farm map for the South Baltic Region, two screens with photo shows, and an exhibition cinema with films on offshore wind energy.



The Rostock exhibition was inspired by a previous project, developed by the 4POWER project partner German Offshore Wind Energy Foundation in 2008. Supported by the German Ministry for Environment and the INTERREG project POWER cluster, the travelling exhibition “Fascination Offshore” was designed for presentation on a museum ship during the summer months. It called on more than 40 ports in the North Sea and the Baltic Sea from 2009 to 2011 and counted more than 100,000 visitors. With such impressive results, the exhibition turned out to be a very successful offshore wind energy promotion tool, attracting residents of coastal areas, but also large numbers of tourists from inland regions. Building upon this success, the German Offshore Wind Energy Foundation developed a new and updated travelling exhibition to be shown onshore across Germany. This exhibition visited several cities during 2013 and 2014. It has been co-funded by the German Ministry of Environment (since 2014 Ministry for Economic Affairs and Energy). To make optimal use of the materials developed for the exhibition, some elements have now been integrated into other permanent exhibitions, e.g. in Cuxhaven, Bremerhaven and the island of Helgoland (SOW 2014).

As indicated before, both exhibition projects created a great deal of interest among the 4POWER project partners. The need for similar presentations was explicitly stated - in some cases first related steps were already taken. As for the Groningen region: Resulting from the exchange generated by the

project, an organization has been established to design a similar permanent exhibition, named Knowledge Platform Energy (KWPE). An independent platform will be developed, aiming to explain and interpret issues related to both onshore and offshore wind energy. This independence is particularly important, as both parties – project development and government – are not always trusted by the public. The platform only makes sense if it is seen to be trustworthy and not influenced by special interests.

Another initiative by the German Offshore Wind Energy Foundation shows how digital approaches can provide detailed information which contribute to making the projects and procedures more transparent. The website www.offshore-windenergie.net, available in German and in English, provides comprehensive information on all aspects of offshore wind energy in Germany. Run by the Foundation in cooperation with IWR, a renewable energy institute, the website has been created on behalf of the Federal Ministry for Economic Affairs and Energy (BMWi). It includes a regularly updated project register, providing an overview of all the offshore wind farms in Germany, both built and in planning. This register is maintained in close collaboration with the relevant public authorities and the project developers. Factsheets provide an overview of key aspects of offshore wind energy in Germany, with reference to further sources. By fostering transparency on offshore wind deployment, this website contributes also to a broader level of local acceptance, which justifies the significant manpower and funding required to keep such an ambitious project up-to-date.

Young people from schools and a wide local public, as well as tourists in general, are the main target groups for offshore wind energy tourist attractions. The development of offers similar to those described above was recommended to the project partners, and presented to several tourism professionals, who thought this a good idea. The goal behind this approach is to educate people from various backgrounds and with different levels of knowledge of the sector, i.e. not only newcomers but also those with previous knowledge who are given the opportunity to learn more.

Training and education

What	Identify potential gaps in the availability of skilled labour. If needed, promote the creation of appropriate training opportunities.
Who	Regional authorities, in close collaboration with offshore wind industry and training providers.
How	Assess prospects for offshore wind deployment and the need for training; communicate the results to the decision makers in the regional labour market, the offshore wind sector and the regional training providers; promote the establishment of dedicated training opportunities.

Even though it might sound paradoxical in times of high unemployment, the availability of skilled labour can be a major bottleneck for offshore wind deployment. At European level, nearly 50,000 additional trained staff will be needed in the wind energy sector (onshore and offshore) by 2030 (EWEA 2013a). Specialised workers are scarce, especially for installation works and O&M, but also for project development and project management, and in some cases for the manufacture of components (iit & dsn 2012, SB OFF.E.R. 2013).

Therefore, training and education is a key challenge for the offshore wind sector. Project

implementation is easier in regions where a sufficiently skilled workforce is available, but more difficult where this condition is not fulfilled.

For regional governments, this means that the capacity to make skilled labour available within a reasonable time is a relevant factor in the competition among regions to attract large-scale investment in offshore wind deployment, and should be addressed. All other factors being equal, an investor might well favour one project over another because it is located in a region better able to draw on a specialised workforce.

Once the investment decision for a specific offshore wind plant has been made, the competition among regions continues. To avoid paying relocation fees, the project developer will seek to hire a local workforce when possible. However, if people with the needed skills are not available in the region, the developer – usually operating under time pressure – will probably seek to hire people from other regions and not wait for local training programs to become effective. This is the case in particular for highly skilled and thus better paid functions.

Mobility of a specialised workforce is a normal process in a market economy, and partly unavoidable in a project driven business, such as offshore wind. However, it lies in the interest of the regions for skills to be rooted in the local population and not mainly imported from outside, since the establishment of sustainable economic development is then more likely.

Therefore, the long-term coordination of training programs for offshore wind skills is in the interest of regional economic development.

What regional authorities can do in practice

Assess prospects for offshore wind deployment: As a first step, it is essential that regional authorities obtain a realistic assessment of the scope and timing of potential offshore wind deployment in their region. For this task, a collaboration with experts from the offshore wind energy sector and with the (national) authorities responsible for the most important aspects of the framework (permitting, support schemes) is essential. If the timing or the scope of offshore wind deployment in the region is underestimated, the region risks losing investments or missing the opportunity of a sustainable growth in employment for its residents. However, if the potential is overestimated or the timing viewed too optimistically, the region risks generating stranded investments into training efforts.

Assess the need for training: The next step is the detailed assessment of the labour force required at various stages of project development, and of how the regional workforce fulfils the expected demand for specialised labour. This analysis should cover both academically trained staff, such as mechanical and electrical engineers, and a broad spectrum of technical qualifications, including logistics, transportation and especially maritime work and installations, as well as the workforce required for service and maintenance. For the latter, staff with experience in other maritime sectors usually bring with them valuable expertise.

Communicate the results of the analysis: As far as no significant gaps are identified, this information should be proactively communicated to the offshore wind energy sector, as it can help to attract investments to the region. If shortcomings are found, further analysis needs to identify the training opportunities available to fill the gap. Then, appropriate information campaigns should be implemented, addressing potential employees (young people at school or university, active or





unemployed workforce with relevant qualifications) as well as relevant training providers in the region or in surrounding areas, ranging from technical training centres to universities, research centres and industrial companies.

Promote training opportunities: Depending on the specific conditions in each country, regional authorities may play different roles when it comes to promoting new training and education programs. For the establishment of regional offshore wind training programs, the advice of practitioners with significant experience should be sought. Regional authorities can envisage public-private partnerships concerning the financing of training programs: project developers and industry will often be interested in such solutions. Any training and education program for offshore wind should be guided by international standards (e.g. health and safety), in order to prepare the workforce for the international market, i.e. qualify it for a range of countries with potentially differing requirements and regulations.

Establish closer cooperation between local industry and vocational schools: The education of skilled staff requires enhanced cooperation between vocational schools and the companies constituting a local supply chain. Important aspects of the co-operation should be the creation of opportunities for hands-on, on-site learning at the companies, as well as development of training facilities at the vocational schools.

Many of the above recommendations are not only relevant for staff that is involved in the offshore wind sector for the first time, or for regions developing their first offshore wind plants. Ongoing qualification of offshore wind workers and technicians is essential to ensure that they stay up-to-date with regard to technical and process issues – the life-long-learning principle is particularly relevant in a field characterised by such a rapid technological learning.

Good Practice Examples

Within the context of the project 4POWER, assessments, as recommended above, were implemented, for instance in Emden, Rimini and Rostock. In all cases, the evaluations on the topic were inspired mainly by a Scottish initiative called Energy Skills Partnership, which was initiated in order to raise awareness regarding skill development needs deriving from related shortages in the



offshore wind energy sector. The initiative resulted into a cooperation between Scottish colleges, universities, employers and employer federations with the institution Skills Development Scotland and the Sector Skills Councils, and, of course, current and future employees and apprentices. The Scottish government actively supported this collaboration. As a result, high-quality educational offers for offshore wind are now available in Scotland. In addition, an Energy Skills Challenge Fund has been established to support up-skilling of the existing workforce, as well as re-skilling of people entering the industry from other sectors.

Guided by this best practice example and the project recommendations, different players from the offshore wind energy sector in Rostock and Emden analysed their regional situations and identified staff shortages and communicated a strong need for education opportunities pertaining to offshore wind energy. Resulting from this, an endowed professorship for wind energy was established at the University of Rostock in 2013. It is allocated to the Department of Mechanical Engineering and Shipbuilding and will be financed by the wind turbine manufacturer Nordex for 5 years. Related to this, a bachelor program “Wind Energy Engineering” has been developed and will commence in autumn 2014.

Another best practice identified by the 4POWER project is implemented in Malta. It addresses students who are working towards a degree at the Faculty of Engineering at the University of Malta. These students undertake a final-year project in cooperation with professionals as an essential element of their program, demonstrating all the skills acquired during their previous studies.

In Emden, the analyses identified a lack of qualified personnel along the entire offshore wind energy value chain. Inspired by relevant schemes implemented in Scotland and the Netherlands, an initiative was started within the framework of the “Offshore Hub Ems-Axis (OHEA)”, in cooperation with market participants, potential employers and educational institutions, such as universities and schools, with the aim to overcome the shortage of skilled workers: The “Offshore Hub” project, operated by the Mariko (Maritime Competence Center) since January 2014. This project aims to build network structures among stakeholders in the Ems-axis region, transferring knowledge and providing know-how related to offshore wind energy to individual companies and the region as a whole. Through targeted location marketing, strengths and competences of the region shall gain visibility. This location marketing is complemented by the initiation of cooperation between companies, universities, institutions and other stakeholders at European level, but also by work on the issues of port infrastructure and logistics (MARIKO 2014).

In addition, the network “Wachstumsregion Ems-Achse” was established, which stands for a joint economic region fostering economic growth and employment opportunities, to be achieved through development and implementation of projects and the improvement of communication among the companies in order to gain and amplify knowledge. The network sees the necessity to strengthen the offshore wind industry in the northwest of Lower-Saxony. Especially for Emden, with its port being a base for the pre-assembly, transportation and maintenance of the offshore wind turbines for several wind farms in the German bay, the offshore industry is an important economic factor (Ems-Achse 2014).

In Rimini region, the assessment of the regional situation resulted in the understanding that it is still too early to start a larger regional education initiative, as no related employment markets have been established so far. Still, the investigations have created an awareness for the issue, so that the region will be able to respond more quickly to upcoming needs and monitor the situation over the coming years, particularly since the first offshore wind energy related co-operations, e.g. with Siemens, have

been established in the context of the 4POWER project and are expected to potentially result in the first offshore wind energy pilot projects soon.

A recent initiative in this sector comes from the Engineering Faculty of the University of Bologna, which has collaborated with the Province of Rimini within the context of the 4POWER project. Resulting from this, a Centre for Offshore and Marine Systems Engineering (COMSE) was established at this university in 2014. It will focus on coordinating and promoting activities and initiatives related to planning and management of marine and offshore systems, and on studying the marine environment and the technologies for a sustainable exploitation of offshore resources (Università di Bologna 2014).

As another best practice, the Scottish government Offshore Wind Route Map (SOWRM 2013) was considered particularly valuable for future offshore wind energy work in Gdansk, Emden and Rostock. The SOWRM includes the identification and summary of available skills in the oil and gas sector as well as in the marine engineering field, but also in sectors such as mechanical and electrical engineering, aerospace technology, construction and property development, with the aim to make these exploitable for business issues related to offshore wind energy.

The Scottish OSW Route Map itself is currently being updated with actions required to secure a vibrant offshore wind industry in Scotland – the project 4POWER has been a contributor to these during the consultation period, as both projects are running concurrently. Based on the inputs from the project, as well as from the Scottish offshore wind energy players, the map will from now on be regularly updated, and these updates will feed into the overall renewables objectives published within the 2020 Renewable Route Map for Scotland.

Relevance of the national and EU framework for regional development

The document on hand has shown clearly how large the influence regions can take on offshore wind energy developments actually is – and how much these regions can profit from positive developments in this sector. This was, in exemplary manner, demonstrated by the regions which were involved in the exchange of knowhow and experience implemented in the context of the 4POWER project – where both sides, countries with experience in offshore wind energy, as well as those who have just entered the field, have greatly profited from the 3 years of cooperation and joint effort on the different topics.

As specific implementation plans for every single region were elaborated in the framework of the 4POWER project, the partners are available for advice and consultation regarding specific recommendations and steps beyond what could be included in the paper on hand. Please find the papers and partner contact details at www.4-power.eu.

Of course, successful further development of offshore wind energy production requires efforts on all levels of politics and business. National and EU level policies have to play their part in support of the sector as well. To encourage related efforts, the project has drawn up a further document, called EU and Regional Policies for Offshore Wind: Creating Synergies, which is mainly addressed to EU politicians, and tries to raise their awareness regarding offshore wind energy promotion.

Based on all these efforts, the project hopes to make a significant contribution to the promotion of offshore wind energy in Europe, and thus to the implementation of large-scale climate protection measures – for the benefit of each region as much as for the benefit of Europe as a whole.

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Title picture: Offshore wind farm Baltic I in the German Baltic Sea
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