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Offshore Wind Energy in Europe – Fresh Wind for Insurers, Too?

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Offshore Wind Energy in Europe – Fresh Wind for Insurers, Too?

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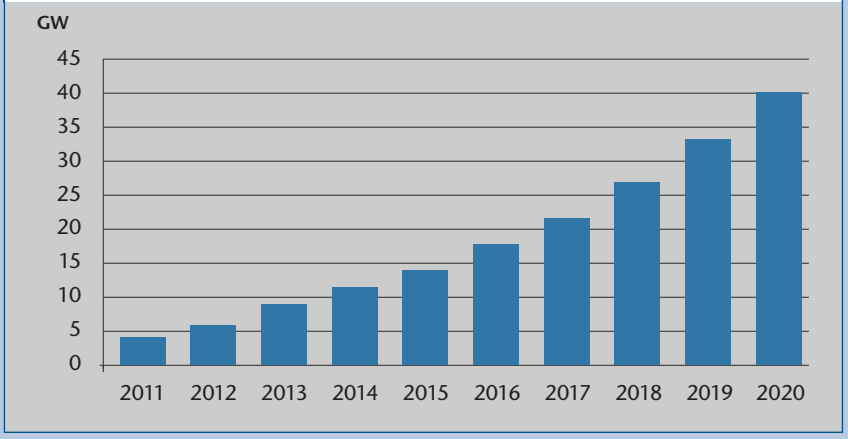
Offshore wind farms promise to become an important energy source in Europe. According to a study by the European Wind Energy Association (EWEA), the expectation is that by the end of this decade wind farms with a capacity of 40 gigawatts (GW) will be erected in European waters (see Figure 1). This represents a tenfold increase compared to the present capacity and corresponds to 8,000 wind turbines at 5 megawatts (MW) each. The offshore wind farms will replace the electricity production of numerous major conventional power plants; as a result, the emission of 102 million tonnes of CO_2 can be avoided.[1] For this expansion, investment of approximately EUR 75 billion is necessary through 2020 (see Figure 2).

Without comprehensive insurance protection, however, investors will usually not make capital available for these projects. Thus, insurers have an opportunity to take on a central role in the expansion of offshore wind energy. For them, this represents the development of a new business area, with an important demand for insurance and a significant premium volume. According to our estimates, in the Property and Engineering insurance lines of business the volume of premiums could amount up to EUR 1 billion at the end of this decade (see Figure 3). Even if these estimates contain a range of factors of uncertainty, the indication is that the opportunities and the potential for business are evident.

Where are the wind farms to be built?

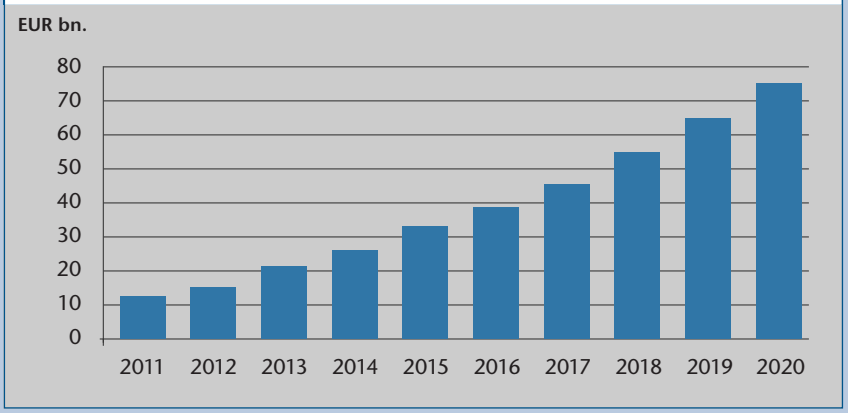
A study by the EWEA[2] identified offshore projects with a capacity of 141 GW in 18 European countries, projects that are to be built in the period reaching beyond 2030 (see Table 1 and Figure 5). By far the largest part is to be erected in the shallow waters and windy areas of the North Sea, whereby the United Kingdom and Germany are already contributing more than 50 % of the capacity. There the wind farms will not solely be located close to the coast; rather, in some instances they will be several hundred kilometres away from the coast and cover large areas of the North Sea.

Offshore wind power cumulative installations in Europe Figure 1



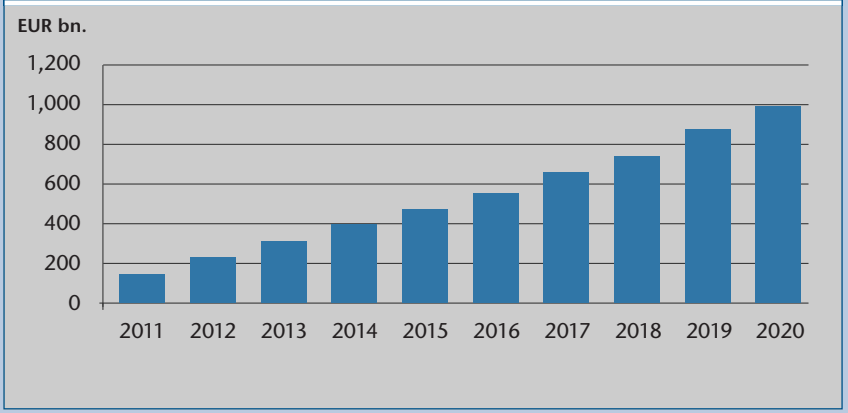
Source: EWEA

Offshore wind power investments in Europe (without network connections) Figure 2



Source: EWEA

Annual premium volume for property covers (installation and operation) Figure 3



Source: Estimate – Gen Re

What challenges do these projects face?

In the sea, the wind turbines are subjected to difficult conditions in their surroundings. Apart from wind, waves and salt water, in many instances they will be positioned on a sandy foundation, in water up to 50 metres in depth. For the anchoring of the wind turbines, which are up to 150 meters high and weigh several hundred tonnes, stable foundations are absolutely essential.

Offshore wind turbines are getting bigger and bigger. At present, 3.6 MW is the minimum output value for newly built wind parks, and wind turbines of up to 15 MW are already being developed. Whereas the first offshore machines were still modifications of onshore wind turbines, the new wind turbines are being designed solely with offshore operation in mind. Development is proceeding dynamically, and often the past offers little or no experience from which to draw.

The production of thousands of wind turbines requires additional production capacity and production facilities, but also requires harbours with corresponding quay facilities and extensive storage areas.

For the transport and the erection of the wind power units, special construction vessels (jack-up barges) are used. These lifting ships can prop themselves up at a fixed position in the sea, with legs up to 60 metres long, and install the wind power units using cranes. At present there are only few of these ships in Europe, costing up to EUR 100 million each; consequently, a bottleneck has developed in the process of erecting wind parks. However, additional jack-up barges are under construction, with about 15 scheduled to be completed this year. A schedule of future projects is already planned for them.

A further bottleneck is the link-up to the electricity grid. In the case of wind parks not situated in immediate proximity to the coast, the electricity is bundled together in an offshore electric power substation (see Figure 4)

Figure 4: Offshore transformer platform
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Planned Offshore Wind Power Capacity in MW (in excess of the year 2030)[3]
Table 1

UK	48,596
Germany	31,247
Norway	11,394
Sweden	8,279
Spain	6,804
France	6,000
Netherlands	5,992
Greece	4,889
Finland	4,294
Ireland	3,780
Italy	2,700
Denmark	2,471
Belgium	1,857
Estonia	1,000
Poland	900
Portugal	478
Latvia	200
Malta	95
Total Europe	**140.976**

Source: EWEA

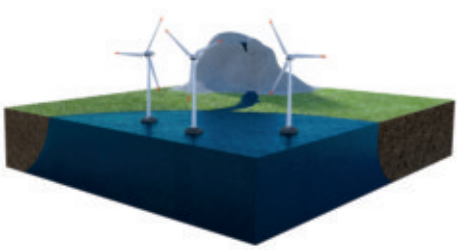
Apart from wind, waves and salt water, in many instances turbines will be positioned on a sandy foundation, in water up to 50 metres in depth.

and then transported with a higher voltage to land, via a sea cable. If the wind parks are located more than 50 km away from the coast (as in the North Sea, off the coast of Germany), the electricity from several wind farms is converted into direct current so that the transmission losses do not become too great. For this purpose, additional high-voltage direct current (HVDC) transmission units are essential; these cost several hundred million Euros each. The operators of the electricity grid are responsible for erecting and operating these "electricity sockets at sea". If the expansion of HDVC transmission units is delayed, as is currently the case in Germany, it has direct consequences for the construction of the wind parks.

What challenges do Property and Engineering insurers face?

Prototypes, in particular, constitute an increased risk for insurers. Despite extensive calculations, simulations and tests, the danger of so-called series claims exists, affecting numerous wind turbines of the same type. Hardly any component part does not represent a risk. Apart from problems with the foundations, difficulties have already emerged with the generators, the gearboxes and the shafts of individual models.

For the erection of wind parks, sea transportation activities involving major investment of resources are required (e.g., foundations, towers, nacelles, rotor stars, offshore transformer platforms) in addition to the installation of the wind turbines. After installation is complete, the wind turbines are brought into operation on a step-by-step basis, one after another. Important for an insured, therefore, is comprehensive coverage, without any gaps, from manufacture, via transport, through to installation and operation. This requires insurance coverage spanning



insurance lines of business. Apart from the customary cover modules for onshore risks, this must also encompass special extensions of coverage, such as add-on costs due to bad weather (standby charges) or offshore cancellation costs for the cancellation of contracts for jack-up barges or special offshore construction equipment.

Apart from the coverage for property damage, many investors demand coverage against the financial loss resulting from delays caused by property damage during the building phase, or interruptions during the operational phase. Here too, customers seek end-to-end coverage, without gaps, for damages due to interruptions during the phases of transporting, installing and operating the equipment. For underwriting, it is thus essential to have comprehensive know-how of various sectors of business, in addition to specialist knowledge regarding offshore risks, to be able to offer client-specific insurance solutions and having a thorough understanding of the wide cover provided.

A further challenge to insurers is the long policy period: Apart from the process of erecting wind turbines, which takes several years, the policies frequently also cover the first one to two years of operation.

The Sums Insured involved in a wind park are large. For a wind park with 80 or more wind turbines, they amount to EUR 1 billion or more. Where applicable, several more hundreds of millions of Euros must be added for business interruption insurance cover.

The calculation of a Possible Maximum Loss (PML or MFL) is currently subject to great areas of uncertainty, as there are still not yet sufficient instances of experience to take as a basis, nor sufficient calculation models to use. Exposures to large-scale losses arise primarily from the natural perils involved, including, in particular, windstorms and the swell of the sea (also “monster waves”), fire damage, instances of impact from ships and series claims due to components in wind turbines. When calculating values, what must be taken into account above all are bottleneck areas with high concentrations of value (e.g., an offshore transformer platform and the export cable, equipment that bundles together all the electricity produced and transmits it to the land). Thus, maximum possible losses can amount to several hundred million Euros for one wind park. And consequently, a high demand for capacity exists, both for an individual wind park and also for accumulation exposures from several wind parks, most certainly because one windstorm can affect several wind parks in one region (e.g., the North Sea).

Accumulation risks are particularly problematic for insurers, because a balancing-out effect across a larger number of risks cannot be guaranteed, or can only be guaranteed to a very limited extent. Considering that among the entire investment sum intended for offshore wind parks, ca. EUR 75 billion in 2020, a large part of which is directed to North Sea facilities, the potential exposure to large-scale losses becomes evident. The provision of accumulation capacities is a traditional business segment for reinsurers.

However, what they have to take into account is that significant amounts of liability are already being borne with regard to storm coverages for onshore risks (e.g., residential buildings) in northern Europe. They can accumulate as well if a windstorm event emerges. Accumulation exposures in the North Sea are becoming one of the greatest challenges for the insurance industry, and other options should be considered, such as capacities offered by the financial markets (e.g., securitisations) or governmental liabilities.

A further challenge is the scope of coverage demanded by the investors with regard to the insurance for business interruptions. Beyond the immediate loss itself there is demand for cover against contingent business interruption losses with regard to suppliers or customers. Essentially, these exposures relating to offshore wind energy emerge from three areas:

- Transmission of electricity to the land. (In many countries the responsibility falls not with the wind park operator but rather the electricity grid operator)
- Manufacturers of components for wind power systems (e.g., wind turbines, rotary blades, sea cable)

Planned offshore wind parks in the North Sea Figure 5

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- Construction vessels (jack-up barges)
  If delays or interruptions arise due to property damage at one of the component manufacturers, to the construction vessel or the external installations for transmission of electricity, the idea is that damage resulting from this interruption is also to be compensated.

These liabilities can easily reach several hundred million Euros for one wind park. In addition, there also exists a significant accumulation exposure. Only a limited number of manufacturers produce components for wind power equipment, and their production capacities are usually booked out far in advance. In addition, in Germany the electricity from several wind parks is transmitted via one transformer platform and one sea cable.

For insurers and reinsurers, it is important to take these dynamics of accumulation into account and to manage the issues involved in a way that corresponds to the available risk-taking capabilities of the individual carriers. For example, liabilities can also be managed by agreeing on sublimits for contingent business interruption covers or other relevant accumulation perils.

How can we help you in addressing these risks?

We are happy to have an open dialogue with you about the opportunities and challenges presented by offshore wind power risks. With our experience in these areas of risk, we would like to support and accompany you in tackling them and jointly benefiting from the business possibilities of fresh offshore wind.

[1] EWEA – The European Wind Energy Association, Wind in our Sails, November 2011.
[2] Ibid.
[3] Ibid.

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