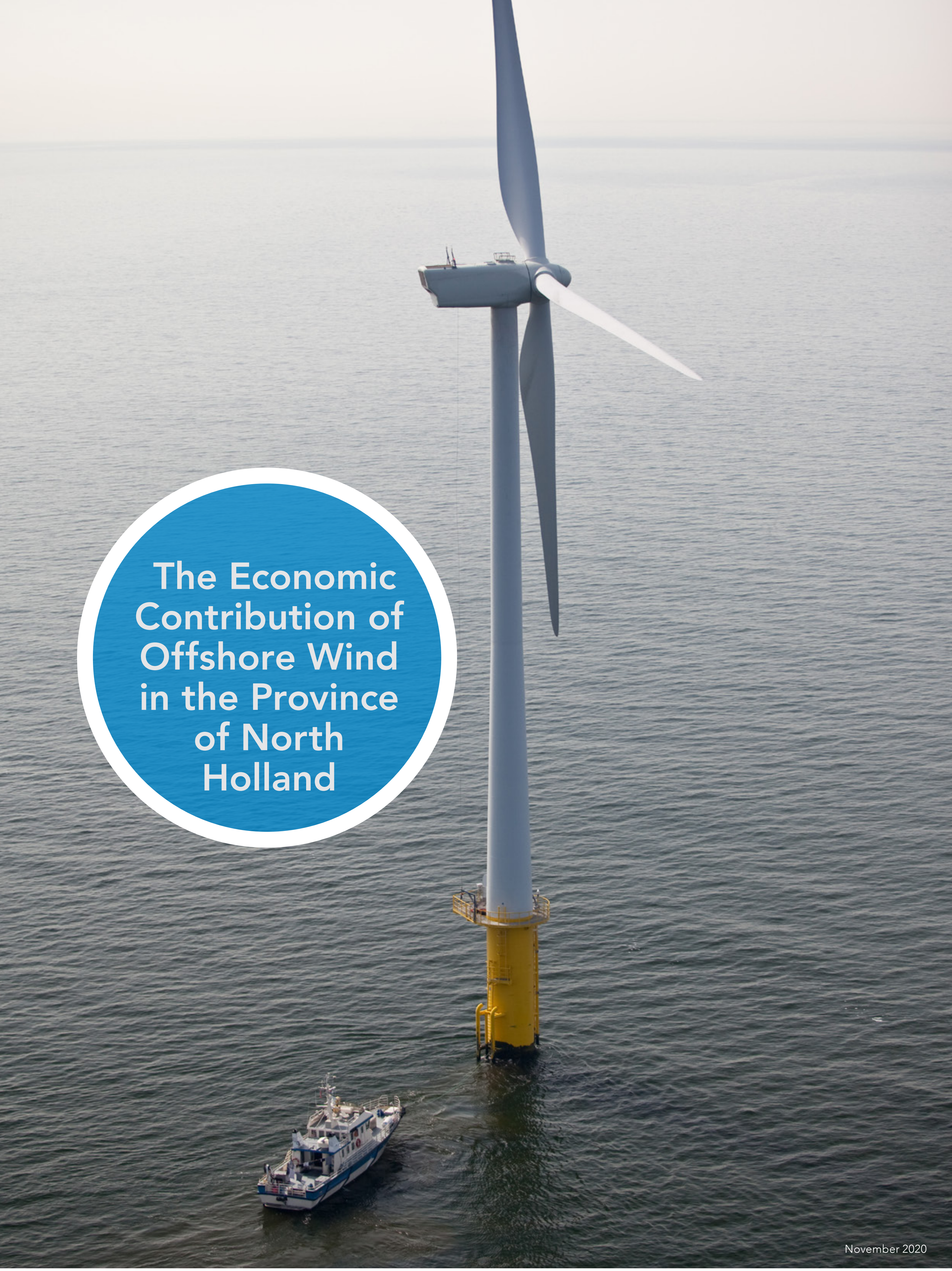
The Economic Contribution of Offshore Wind in the Province of North Holland



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PORT OF DEN HELDER

Executive summary

This study presents an estimate of the potential economic contribution in the province of North Holland of the wind farms to be constructed in the Dutch North Sea during the period from 2020 to 2030. The two economic value scenarios outlined in the study have been based on the 2020 situation – a 'high' scenario and a 'low' scenario – and look ahead to 2030 and 2050. In addition to revenues, the conclusion also contains minimum employment numbers for the area. The study was conducted by Port of Amsterdam, Port of Den Helder and IJmuiden Seaport and subsequently reviewed by the Netherlands Organisation for Applied Scientific Research (TNO).

The costs associated with the wind farms were calculated based on amounts listed in the publication 'Guide to an offshore wind farm' (The Crown Estate, 2019). Additional information was gathered through interviews with port authorities and cluster organisations, as well as gleaned from literature review and various expert opinions. The revenue scenarios have been structured based on a bottom-up approach. The study focuses on businesses operating in the offshore wind industry and on existing business operations. The estimates show that the wind farms slated for construction will result in an increase in the revenues of local businesses and boost employment in the province of North Holland.

The study reveals that the future wind farms have the potential to generate direct revenues of a minimum of ~1 billion euros (in the 'low' scenario) up to a maximum of ~2.8 billion euros ('high' scenario) during the period up to 2030. The bulk of the revenues earned by North Holland-based companies is generated during the O&M (operations and maintenance) stage, followed by the installation stage, the development stage and, finally, the operation stage. The economic contribution is expressed in revenue; please note that this is not the same as added value.

The construction of the wind farms will lead to an increase in employment. The impact on employment in the province of North Holland was investigated in a recent report published by ECHT (2019), which reveals that the construction of the wind farms will create a minimum of 1,375 working years of employment on a one-off basis. The long-term annual demand for labour will increase to a minimum of 790 FTE of employment by 2030.

This steadily recurring employment for maintenance mainly involves work for technical personnel, is long-term in nature, and will remain in place for 20 to 30 years following the completion of the wind farm. The report makes it clear that these represent absolute minimum employment numbers. One limiting factor is a possible shortage of technically skilled workers, for which an action plan is proposed in the ECHT report.

Contents

1. Background and Assumptions

1.1 Scope

The purpose of this study is to provide an indication of the economic impact of offshore wind farms in the province of North Holland (Roadmap 2030[1]). The amounts used are those listed in 'Guide to an offshore wind farm'[2], a study published by The Crown Estate (the authority responsible for awarding seabed rights for wind farms in Great Britain) in 2019. This authoritative report is designed specifically to inform readers about the various aspects and processes involved in operating an offshore wind farm. It contains detailed, up-to-date cost breakdowns, which are often comparable to – or can be applied to – conditions at Dutch wind farms.

The costs associated with construction, installation and maintenance vary for each wind farm and depend on the conditions on site. Based on a literature survey and various expert opinions, we have attempted to convert the amounts listed in the 'Guide to an offshore wind farm' publication into amounts for Dutch wind farms. The following variables were factored into the study (list is not exhaustive): size of the wind farm, components, transport costs, distance to the coast, landings, and expected O&M strategy. Costs have been adjusted for a project life cycle of 25 to 30 years[2]. Any revenues from the decommissioning or destruction of wind farms have not been included in the study.

The exchange rate used for converting pound sterling to euro is 1=1.12.

FIGURE 1: SUMMARY OF CALCULATION

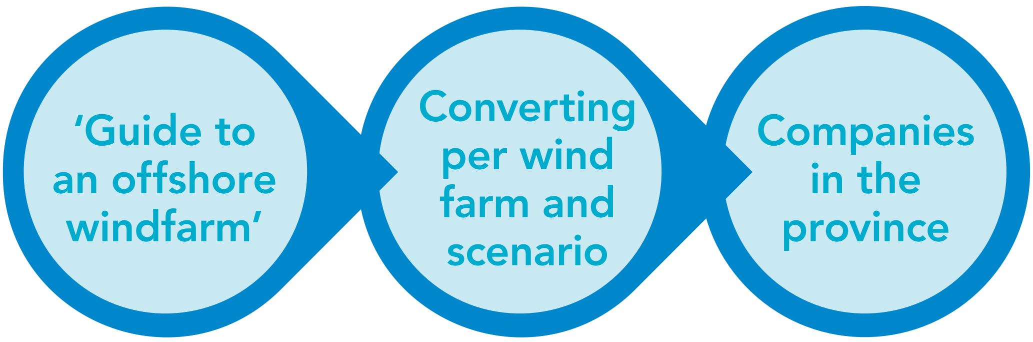


Figure 1: Total costs for a Dutch wind farm are based on amounts listed in the 'Guide to an offshore wind farm[2]'. We then examined the role played by businesses based in the province and the resulting revenue and employment (two scenarios).

The offshore wind farms in the calculation are based on the offshore wind Roadmap 2030[1] : Hollandse Kust Zuid 1,2,3 & 4; Hollandse Kust Noord; Hollandse Kust West 1 & 2; Ten Noorden van de Wadden, and IJmuiden Ver 1,2,3 & 4. Once completed, the wind farms will have a combined capacity of 8,300 Megawatt (8.3 GW). Since the scope of this study is restricted to the economic impact of future wind farms, Prinses Amalia, Luchterduinen, Fryslân Wind Farm, Egmond aan Zee and Borssele offshore wind farms were not included.

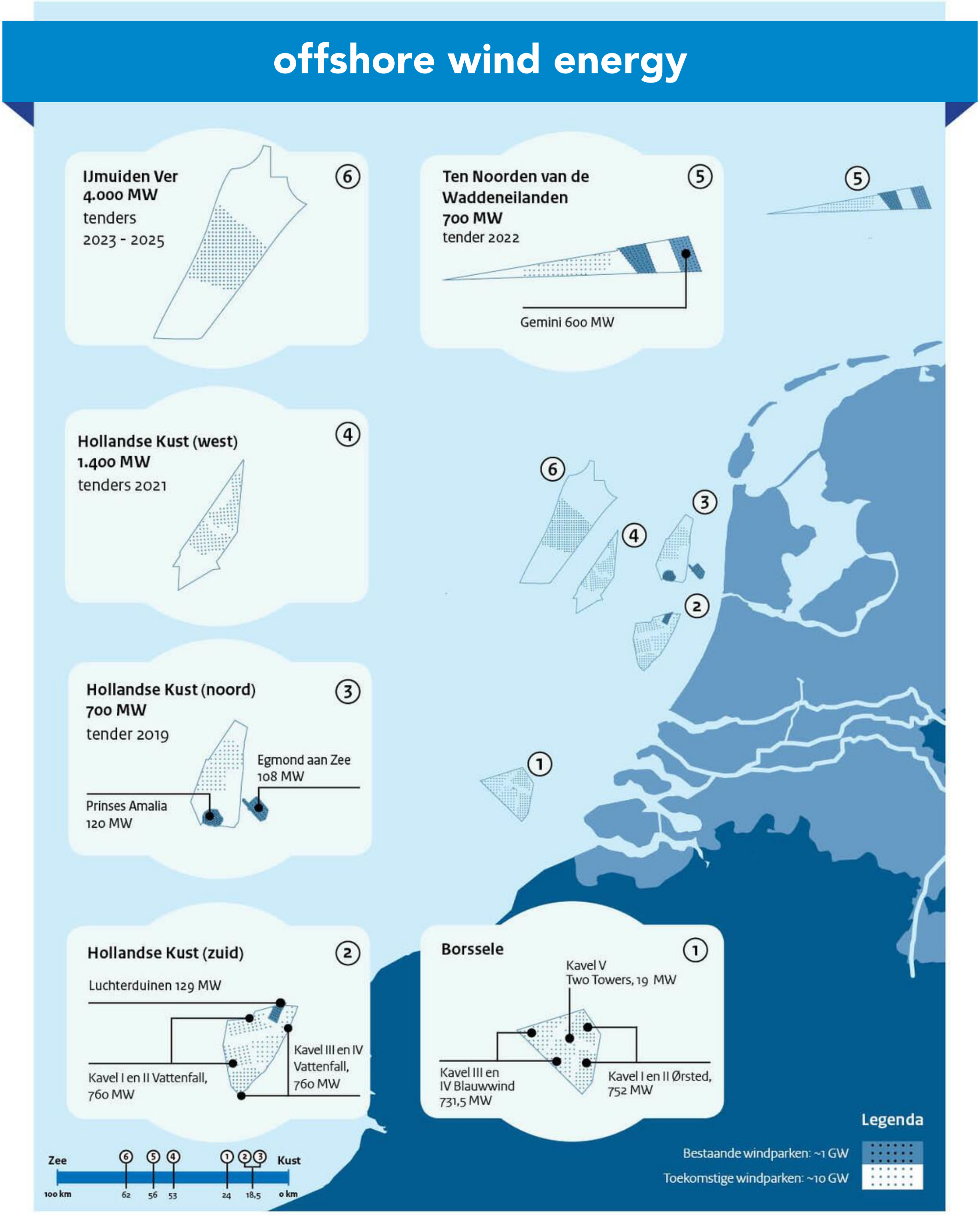
The same applies to the Hollandse Kust Zuidwest/Noordwest wind power zones, for which a final decision is still pending. The study also does not factor in the increase in the number of wind farms after 2030 (currently being investigated by the Dutch government), due to the lack of information available at present.

The offshore community has been discussing the option of an Energy Island for energy conversion, installation preparation, O&M and/or hydrogen production. This could be relevant specifically to the Ten Noorden van de Wadden and IJmuiden Ver wind farms. Previous studies have shown that this could potentially have a significant impact on the offshore industry in the province and will boost company revenues. A recent study conducted by the Netherlands Organisation for Applied Scientific Research (TNO) shows that the ports of Den Helder and IJmuiden are both well positioned to carry out maintenance, construction, and installation[10]. However, since the plans for 2030 have yet to be finalised, the Energy Island has not been included in the scenarios presented in this report.

For a substantial portion of IJmuiden Ver, the option of converting the electric power generated by the wind turbines into hydrogen gas and other resources at sea, rather than transporting the energy to land by cable in the form of electrons, is already being discussed. It may be possible to do this locally in the individual wind turbines or centrally using large platforms or islands. For these large volumes of gas, it makes sense to connect to existing offshore pipelines. A large part of this infrastructure is already landed in Den Helder, where NAM (Nederlandse Aardolie Maatschappij B.V.) also operates a massive gas processing plant. However, these prospects have not yet been included in this study.

In calculating the economic contribution for the province of North Holland, we reviewed the current companies operating in the area, using the member base of the offshore cluster organisations Amsterdam-IJmuiden Offshore Ports (AYOP) and North Sea Energy Gateway (NSEG). Revenues obviously change whenever new businesses settle in the province or leave the province. Since the arrival of the wind farms, the province has witnessed a sharp increase in recent years in the number of companies operating in the offshore wind industry, a trend which is likely to continue with the construction of the future wind farms.

FIGURE 2: WIND FARMS INVOLVED IN THE PROJECT (EXCLUDING BORSSELE)[3]



1.2 Timeframe and Scenarios

The results of this study have been divided into two time periods: from 2020 to 2030 and from 2030 to 2050. These are based on 'Roadmaps[1], Offshore wind power', as described by the central Dutch government. We outlined two scenarios for revenue in the province of North Holland.

The first of these is a 'high' scenario, where all operations which the province can accommodate are actually carried out by businesses located in the province. The second is the 'low' scenario, which includes only operations that are likely to be carried out in the province, for example because it makes no sense to opt for another location. This may be related to sailing distances, or because alternative locations are more expensive, or due to other strategic factors such as electric power transported to land. It would make sense that the actual economic contribution falls somewhere between the two scenarios. Section 2 discusses the accountability for the various scenarios in more detail.

TABLE 1: TOTAL COSTS OF CONSTRUCTION AND MAINTENANCE FOR EACH WIND FARM (in millions of euros)
(conversion based on The Crown Estate[2], adjusted per wind farm on 19 November 2019)

Park	Stage 1 Development & project	Stage 2 Turbine	Stage 3 Balance of plant	Stage 4 Installation	Stage 1 t/m 4 total	Stage 5 Annual O&M
Hollandse Kust Zuid (1400 MW)	174	1400	864	960	3398	115
Hollandse Kust Noord (700MW)	90	700	420	530	1740	60
Hollandse Kust West (1400MW)	174	1400	864	960	3394	119
Ten Noorden van de Wadden (700MW)	90	700	420	530	1740	60
IJmuiden Ver (4000MW)	536	4000	2560	2920	10.016	340

2. About the 5 stages

This section explains how the results were established. We start by summarising the individual stages, and at the end of each stage we provide examples of companies operating in the province which might be involved in these activities. As it is common to hire several subcontractors for several work packages, this is a complex process. Based on economic activity in the province and the extent to which companies have been previously involved, we made a substantiated estimate of companies located in the province which could potentially be involved in the construction of future wind farms.

Based on the model presented by The Crown Estate[2], the construction of an offshore wind farm can be divided into five stages. Stages 1 up to and including 4 represent Capital Expenditures (CAPEX); this concerns the manufacture, construction, and installation of all parts of the wind farm. Stage 5 represents Operational Expenditures (OPEX) once the wind farm has been completed. This involves the constant monitoring, repair and management required by a wind farm throughout its lifecycle.

2.1 Stage 1: Development and Project Management

Stage 1 mainly consists of preliminary research and project management, as commissioned primarily by the Dutch central government, transmission system operator Tennet (electrical infrastructure), and the operator (e.g. in the case of HKZ 1-4, this is Vattenfall). Stage 1 includes, among other things, an environmental study, a soil investigation or seabed investigation, a study into use by people and the impact on animal species. In addition, consultants are engaged in order to learn more about environmental factors relating to the weather and marine life and hydrological and structural aspects of the sea or seabed and the wind farm. During the preparations, the proposed wind farm developer (if a project is tendered) will be focusing mainly on creating a preliminary design and organising tenders in order to ensure highly competitive rates.

Experience has shown that many companies experienced in oil and gas extraction are also involved in the design and construction stage of wind farms. Due to the location of these farms and the access to local businesses, it can be expected that some of these services will be provided by companies located in the province, as the province of North Holland has a strong offshore industry with experience in oil and gas extraction.

A variety of companies are involved in this process. Examples of companies located in the province include: Fugro, T & A Survey, ECN/TNO, McKinsey, engineering firms, Deep BV geoservices.

2.2 Stage 2: Manufacture of the wind turbine

While the design and manufacture of the wind turbine is one of the most expensive stages, only a small portion of these expenses will be incurred in the region, as there are currently no offshore wind turbine manufacturers in the Netherlands. When it comes to components, subcomponents (including the nacelle, the rotating system, electronic or mechanical components, coating, the lift system or steel), North Holland-based manufacturers play a limited role in the supply chain for turbine construction. The revenues for companies located in the province are therefore estimated at nil in the 'low' scenario. However, Kenz-Figee and Tata Steel are examples of companies that could be operating in this area in the 'high' scenario.

2.3 Stage 3: Balance of Plant manufacture

Balance of Plant (BOP) comprises the production of all other components of the wind farm excluding the turbine. This includes, among other things: cables, foundations, offshore high-voltage platforms, onshore transformer stations, the construction of an operational base for O&M, etc. More than half the budget during this stage is spent on cables and foundations, as there are no manufacturers of these items in the province of North Holland. However, the revenue potential in the province during the Balance of Plant manufacture is higher than in the previous stage (turbine construction). This is due to the diversity of the components manufactured and a number of location-related aspects, e.g. the onshore substation.

For the Hollandse Kust Noord, Hollandse Kust West 1 & 2 and IJmuiden Ver wind farms, it is very likely that the landings of the high-voltage cables and substations will be established in the province, as shown in the Roadmap[1]. The construction of the buildings is generally carried out by local businesses, while many other components are also sourced from within the province.

The construction of an O&M base is also categorised under Balance of Plant; initial investments to this end have already been made in the province of North Holland. Utity company and wind farm owner Vattenfall and MHIVestas (turbine manufacturer), for example, have already decided to establish their maintenance service base in IJmuiden. Of course, managing and organising all activities for the wind farms are based in the O&M bases, along with the storage of spare parts and all associated logistics.

Several North Holland-based companies are also involved in the construction of sub-parts for the Balance of Plant. For example, Multimetaal states that so far it has made "every part (...of an offshore high-voltage platform), but never completely." Furthermore, sub-parts such as cranes may be ordered from Wesco or Kenz-Figee. The province is also home to a fair number of leading companies engaged in the manufacture of walk-to-work bridges used to transfer workers from a ship to the wind turbine foundation (e.g. Z-bridge, Kenz Figee, Breman, Multimetaal, Eagle Access, Safeway, etc.).

O&M strategy explained

The construction of an O&M (operation and maintenance) base is classified under Balance of Plant and depends on the chosen strategy.

Since this strategy has an impact on revenues in the province, the various strategies are outlined below. There are two strategies in place: a shore-based strategy and an offshore-based strategy. 'Shore-based' refers to maintenance using various smaller ships (typically approx. 8-10 Crew Transfer Vessels [CTVs] per 1 GW wind farm) which are docked daily (and require around 30m quay space each). According to The Crown Estate[2], a 1 GW wind farm requires approximately 8,000 square metres of space, which is used, among other things, for offices, warehouses, electrical, fuel and bunker facilities.

For distances of more than 50 kilometres off the coast, an offshore-based O&M strategy is being considered. In this case, a large Service Operations Vessel (SOV) is used which normally docks every 14 days (and more frequently in stormy weather) in order to take a new crew of wind technicians on board, offload waste and collect new supplies, which requires approximately 100 metres of quay space. 1 SOV can serve approximately 1 GW of wind-farm capacity. SOVs are often used in conjunction with what are known as 'daughter craft': smaller, fast ships that make it possible to quickly drop off and pick up technical staff working on wind turbines (provided weather conditions are reasonable). SOVs can easily be use the ports of IJmuiden and Den Helder; for larger distances, there are also wind farm owners who use helicopters to drop off technicians, parts and components at the wind turbines.

The advantage of helicopters is that they can still fly in extremely blustery weather (high wind speeds) and technicians, parts and components can still be dropped off at the wind turbine, while CTVs and SOVs are significantly less versatile in their use. Helicopters are highly suited for corrective maintenance to vital offshore infrastructures such as high-voltage platforms. As wind turbines increase in size (currently prototypes of 12 MW, which is likely to be increased further in the future[9]), technical problems involving individual wind turbines will become more significant, which may also result in an increase in the use of helicopters. With Schiphol Airport and Den Helder Airport both located in the area, the province of North Holland provides excellent facilities for this purpose.

Many opt for a strategy of using both SOVs and CTVs from the nearest port, sometimes combined with the use of helicopters. Depending on the strategy chosen, this affects the economic contribution for the province, where it is expected that a shore-based strategy will generate more revenue during the BOP stage than an offshore-based.

2.4 Stage 4: Installation and Commissioning

Any remaining explosives must be detected and removed immediately before the installation stage; North Holland-based companies such as DEEP and C-Ventus specialise in detection. During the installation and commissioning stages, the previously manufactured parts and components are installed off-shore and on-shore and commissioned. Onshore, this includes the connection of the cables, while offshore it includes installing cables, substations, foundations, and turbines. All this is shipped, lifted and transported by operators in offshore logistics. For example, crane companies such as Mammoet, Schot and Winder play a key role in the transhipment of extremely large and/or heavy parts and components from the quay to the installation vessels.

The province is home to a large number of companies engaged in installation (i.e. as subcontractors). For example, SEW, Multimetaal and Abuco are involved in the installation of offshore substations and structures, Blue Stream is working on installing cables through the use of culverts and ROVs (remotely operated vehicles), while WIND is engaged in the transport and storage of the cables. Local employment agencies will likely be engaged to provide ship crews and technical staff. A soil surveyor such as Deep BV must also sail regularly for analysis and inspection of the seabed. Grippers for monopiles are manufactured by Breman.

In addition, a variety of ships are used during the installation stage3 (see the image below).

This will likely increase the revenues of local ports, ship owners, operators and agents such as Vroon Offshore Services, DHSS, Peterson, Acta Marine, Windcat, and others. The major influx of vessels will help shore up the revenues of local service providers, including waste processing companies, security firms, companies specialising in leasing generators, and bunkering companies. It is also expected that parts of the offshore/onshore transport will be handled by local companies such as logistics provider Lubbers Logistics Group. While international contractors are used for offshore work involving the landing of power cables, regional companies are also contracted for support work, including earthmoving companies, dockyards for repairs, and a combination of the above-mentioned services.

TABLE 2: SOURCE; VARIOUS TYPES OF SHIPS AND USE IN EACH STAGE 3

Vessel type vs offshore services	Pre-construction (Phase 1)				Construction (Phase 2)				O&M (Phase 3)	Decommissioning (Phase 4)		
	Environmental Survey	Geotechnical Survey	Geophysical Survey	Installation of Met Mast	Turbine Foundation Installation	Turbine Installation	Converter Station Installation	Cable Installation	O&M Routine and Overhaul	Turbine Decommission	Substation Decommission	Met Mast Decommission
ROV Support Vessel	●											
Geotechnical Survey Vessel		●										
Geophysical Survey Vessel			●									
Multi-purpose Survey Vessel	●	●	●									
Jack-up Barge or Vessel				●	●	●			●	●		●
Heavy Lift Vessel				●	●	●	●			●	●	●
Construction Support Vessel				●	●	●	●			●	●	●
Inter-array Cable Installation Vessel								●				
Export Cable Installation Vessel								●				
Tugboat				●	●	●	●	●		●	●	●
Service Crew Vessel/Boat					●	●	●	●	●			
Diving Support Vessel					●	●	●	●				
Safety Vessel/Standby ERRV					●	●	●	●				
Multi-purpose Project Vessels (MPPV)	●				●	●	●	●	●			
Tailor-made O&M Vessel									●			
Accommodation Vessel					●	●		●				
Multi-purpose Cargo Vessel (MPV)	Primarily provide the inbound services for wind turbine and BOP related tasks											

Bron: BTM Consult, A part of Navigant - August 2013

2.5 Stage 5: Operation & Maintenance (O&M)

The O&M process at a wind farm involves the monitoring, maintenance and operation of the turbines and occurs over the wind farm's full lifespan (20-30 years). This process includes, among other things: inspections, training, logistics, costs for CTV & SOV (ships), helicopters, ROV and diving services, investigation, soil inspection, health & safety inspection, painting, cleaning, and the manufacture and repair of parts, components, and equipment. In order to determine the economic contribution of O&M, it is important to know which strategy (i.e. onshore and offshore) is pursued; this is described in paragraph 2.3: Balance of Plant in the previous section.

The North Holland offshore industry specialises in operations and maintenance, with companies having acquired a fair amount of experience in offshore oil and gas services. Wind farm owners are likely to choose local companies based in Den Helder and IJmuiden for support during the O&M stage.

This is related to the province's proximity to the wind farms. O&M costs are determined to a large extent by distance, and the shortest sailing distance for the majority of wind farms is from North Holland. Examples of companies maintaining sites in the province which are engaged in O&M include: Lubbers, Peterson, DHSS, Windcat Workboats, MHIVestas, Deep BV, Heli Offshore, CHC helicopters, Fugro, Ymond Offshore Logistics, etc. Research[4] shows that approximately 60% of the total O&M budget is spent locally, including approximately one-third on local employment.

3. Results

TABLE 3: REVENUE FROM OFFSHORE WIND POWER IN THE PROVINCE OF NORTH HOLLAND, BY STAGE (in millions of euros)

Wind farm	Stage 1 Development & project	Stage 2 Turbine	Stage 3 Balance of plant	Stage 4 Installation	Stage 1 t/m 4 total (one-off/ nonrecurring)	Stage 5 O&M (annual)
HKZ total (1400 MW)	174	1400	864	960	3398	115
'High' scenario	55.5	14	15.5	50.5	135.5	66
'Low' scenario	19	0	9	8	36	37
HKN total (700MW)	90	700	420	530	1740	60
'High' scenario	35	7	31	52	125	34
'Low' scenario	15	0	16	22	53	19
HKW total (1400MW)	174	1400	864	960	3394	119
'High' scenario	57	14	42	90.5	203.5	69
'Low' scenario	18	0	28	43	89	16
TNvdW total (700MW)	90	700	420	530	1740	60
'High' scenario	34	7	10	22	73	6
'Low' scenario	9.5	0	1	5	15.5	0
IJmuiden Ver total (4000MW)	536	4000	2560	2920	10,016	340
'High' scenario	162	40	68	260	530	172
'Low' scenario	50	0	24	86	160	20
Cum high	343	82	167	475	1062	347
Cum low	112	0	78	164	355	92

3.1 Economic contribution to offshore wind in the province of North Holland – direct revenue in millions of euros

After analysing 'Guide to an offshore wind farm[2]', several scenarios were created for the operations which could potentially be carried out in the province. The amounts in revenue for the province of North Holland were subsequently established on the basis of these scenarios (Table 3). The 'high' scenario outlines a situation where the province's full operational potential is used, resulting in revenue being generated,

while the 'low' scenario is based on a situation in which only the basic operations which the province is assumed to be able to accommodate are carried out. It is likely that activities will be carried out in the province if this could result in gains. This may be caused by factors such as geographic advantages (i.e. sailing distances), economic benefits (because it is more expensive to use another location), or due to other strategic factors (including predefined planned points of the sustainable electricity).

In other words: the 'high' scenario includes all activities/operations which can be carried out in the province. How likely it is that this will actually occur is a separate matter which will not be addressed here. The 'low' scenario focuses on plausibility; if there is no clear preference or reason to have a particular activity take place in the province, it is not included in this scenario.

Inevitably, the actual economic contribution falls somewhere between the two scenarios. If it is unclear whether the location in the province is a decisive factor and will therefore generate revenue, 20% of the 'high' scenario will be calculated. If manufacturing, installation or maintenance in the province do not result in any clear benefits, this revenue has obviously not been included in the 'low' scenario.

This shows that the North Holland offshore wind power industry can generate a minimum of 1 billion ('low' scenario) and a maximum of 2.75 billion ('high' scenario) euros in economic value until the end of 2030. These details are shown in the table below. It also shows that the bulk of the revenue is generated during the O&M stage. In both scenarios, the revenue is not evenly distributed but rather increases as the wind farms are completed.

Service and maintenance are provided from the time of the completion of the wind farms. From 2030 to 2050, the estimate shows that offshore wind farms annually contribute between 92 million and 321 million euros to the North Holland economy. Any economic activities after 2050 (e.g. dismantling) have not been included in this report.

TABLE 4: ANNUAL REVENUE IN THE 'HIGH' SCENARIO (in millions of euros)

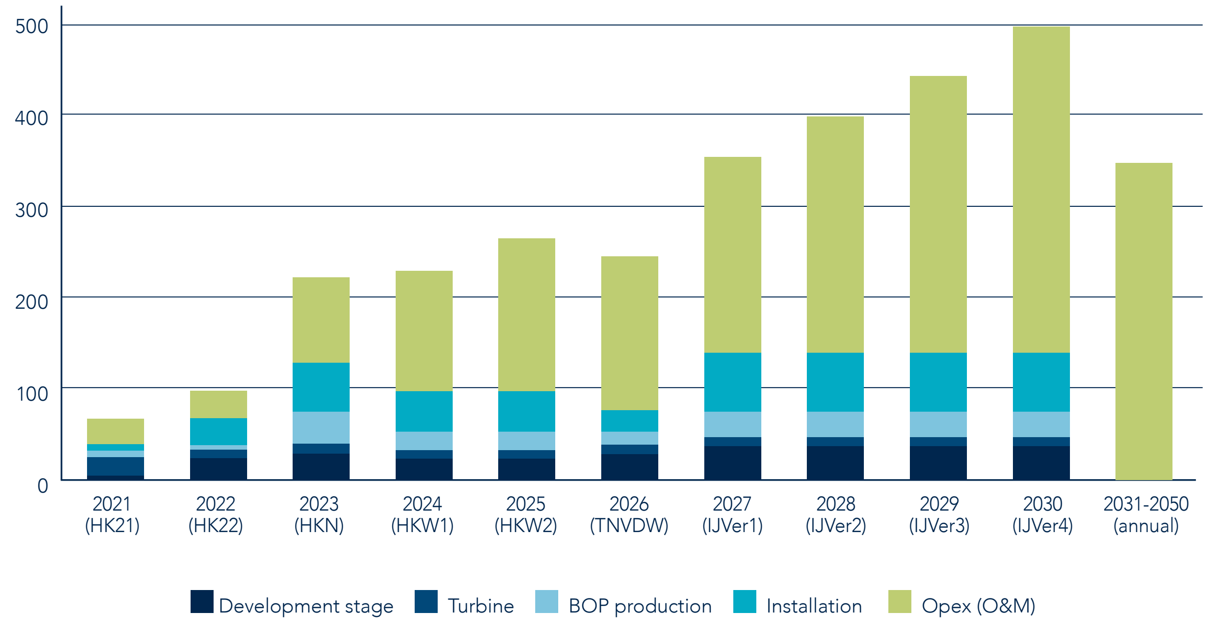
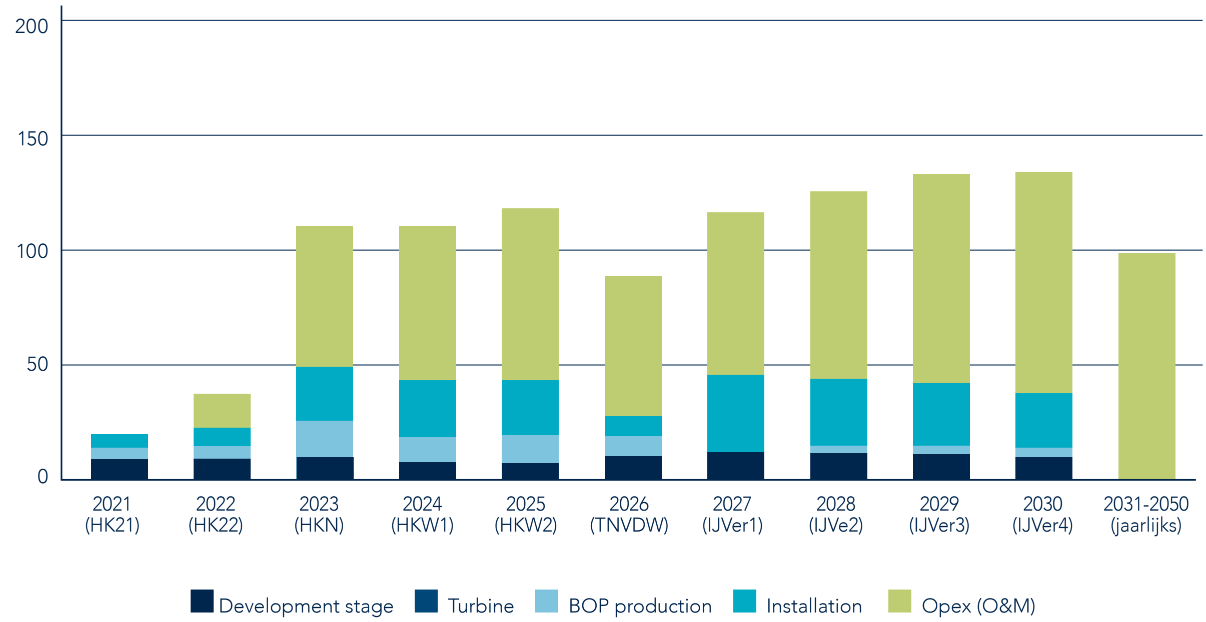


TABLE 5: ANNUAL REVENUE IN THE 'LOW' SCENARIO (in millions of euros)

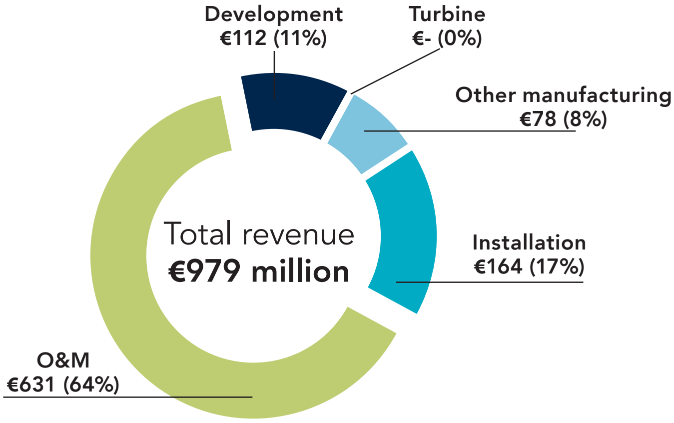


Figures 3 & 4 show the cost breakdown for each stage, stated in millions of euros. They reveal that in both scenarios, the bulk of the North Holland offshore revenue will consist of a) maintenance of the wind farms, and b) (O&M) companies serving the wind farms in some capacity. In addition, the North Holland-based companies play a role during the installation stage, while revenue is also generated during the development and research stage.

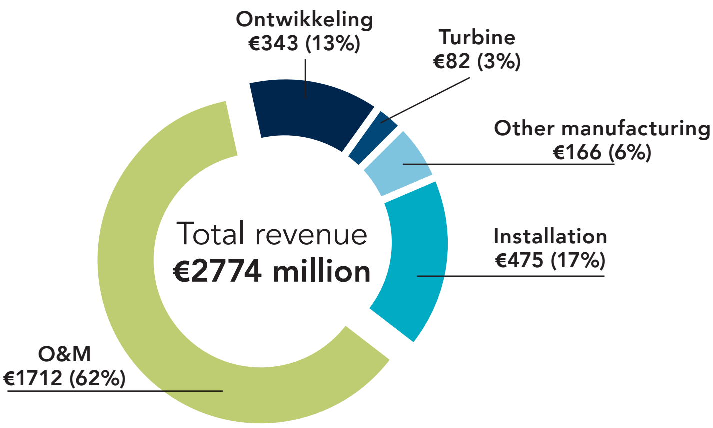
Companies based in the province are not very active during the wind turbine manufacture stage; this is related to the fact that the market for offshore wind turbines is dominated by a small number of manufacturers that do not operate in the province of North Holland. The manufacture of other parts such as foundations and cables also generates little revenue. The North Holland offshore wind industry is characterised by a large number of maritime service providers, while the offshore manufacturing industry is relatively underrepresented, with the exception of several high-quality components and tools.

FIGURES 3 & 4 CUMULATIVE REVENUE PER SCENARIO FROM 2020 TO 2030 (in millions of euros)

OFFSHORE WIND POWER – 'LOW' SCENARIO until the end of 2030 (%)



OFFSHORE WIND 'HIGH' SCENARIO until the end of 2030 (%)



The figures shown in this report for the offshore economy are in line with previous research conducted on this topic. A study performed by PWC (commissioned by the central Dutch government), for example, estimates that the Dutch wind power industry will grow by an annual 8 per cent. This results in an economic contribution of 40 billion euros for the period from 2020 to 2030, including 13 billion from the domestic market. The discrepancy between this 40 billion euros for the Netherlands as a whole and the ~1 to ~2.8 billion for the province of North Holland is explained by the fact that the Dutch wind power installation companies (EPCI contracters) have their base mostly in Rotterdam. The players supply to, and operate in, the global market, where the scope is limited to six offshore wind farms.

3.2 Employment

Unlike Rotterdam, the North Holland offshore industry is characterised by local manufacturing, maintenance, and employment. The employment numbers are reproduced from a previous study conducted by ECHT[11], which has a similar scope, as it focuses on the same wind farms and capacity in terms of Megawatt. The ECHT study differs somewhat from our own research, since it only considers employment in the North Sea Canal Area. This means employment figures for the province as a result of offshore wind power are therefore expected to be slightly higher.

The ECHT study assumes a minimum of 790 FTE by 2030 (minimum numbers in annually recurring employment, mainly for technical personnel). In addition, the study assumes a minimum of 1,375 work years of employment, mainly in the development, manufacturing and installation stages (until 2030). Full time equivalent of employment will continue until at least 2050. The shortage of technical personnel is cited as a limiting factor in the region, while the report includes an action plan.

4. Conclusion

The purpose of this study was to provide insight into revenues and employment in the province of North Holland following the construction of future wind farms, as shown in the Roadmap 2030. Two scenarios have been outlined for the periods from 2020 to 2030 and from 2030 to 2050: a 'high' scenario and a 'low' scenario.

The 'high' scenario includes all the operations which the province can accommodate, taking into account the businesses currently operating in the area, and therefore constitutes a specific upper limit. The 'low' scenario is comprised of the aspects which can demonstrably and likely occur in the province due to certain advantages. These aspects may be related to geographic advantages (e.g. distance and travel time), strategic factors (e.g. the predefined landing points of electric power), or economic benefits.

The study shows for each stage, on a bottom-up basis, which companies might be involved in the construction of the wind farms, and in what capacity. Amounts for the various operations carried out during each stage are reproduced from a recent, authoritative, and detailed report

published by The Crown Estate and have been converted to specific situations for Dutch wind farms. This study also draws on information gathered during interviews with port authorities, regional businesses and cluster organisations, as well as gleaned from a literature review and various expert opinions.

These reveal that the North Holland offshore wind industry, as a result of the wind farms to be constructed between now and 2030, will generate revenue of between 1 billion ('low' scenario) and 2.8 billion euros ('high' scenario). This revenue is not evenly distributed, but rather increases as the years progress. There are also substantial discrepancies in each stage, with the bulk generated during the O&M stage ('high' scenario: 62%; 'low' scenario: 64%), followed by the installation stage (17% and 17%, respectively). The development stage is ranked third (13% and 11%, respectively), the manufacturing stage is ranked fourth (BOP: 6% and 8%, respectively), and, finally, the turbine manufacturing stage (3% and 0%, respectively).

A report published very recently by ECHT (2019) states that demand for labour resulting from offshore wind power will increase to a minimum of 790 FTE employment (from 2030 onward). The majority of these jobs are in O&M. In addition, there are 1,375 work years of employment as a result of the other stages. The numbers quoted are for the period until 2030, where it should be noted that these are minimum numbers. One limiting factor is a possible shortage of technical personnel, for which an action plan is proposed in the ECHT report.

Bronvermelding:

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