Ines Zimmermann

Offshore Wind Energy in Bremerhaven

A Case Description

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This paper has been developed as part of the research project "The Ecological Modernisation of Structurally Disadvantaged European Maritime Port Cities", carried out by the University of Hull (UK), in collaboration with the University of Applied Sciences in Bremen (Germany). The study investigates whether climate change can offer new opportunities for cities to induce economic modernisation and development, to enhance their social structures and to improve their external images. The two port cities Bremerhaven (Germany) and Hull (United Kingdom) have been chosen as case studies due to similar socio-economic structures and developmental challenges.

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List of abbreviations

AFZ	Arbeitsförderungszentrum (Center for Labor Promotion)
AUF	Förderprogramm zur Angewandten Umweltforschung (Program for the Promotion of Applied Ecological Research)
AWI	Alfred Wegener Institute
BIAS	Bremen Institute for Applied Beam Technology
BIBA	Bremen Institute for Production and Logistics
BIS	Bremerhavener Gesellschaft für Investitionsförderung und Stadtentwicklung mbH (Bremerhaven Economic Development Company)
BRAG	Bremerhavener Arbeit GmbH (Bremerhaven Association of Labor)
CT1	Container Terminal 1
CWMT	Center for Wind Energy and Maritime Engineering
DyNaLab	Dynamic Nacelle Testing Laboratory
EEG	Erneuerbare Energien Gesetz (Law on Renewable Energies)
EFRE	European Fund for Regional Development
IFAM	Fraunhofer Institute for Manufacturing Technology and Advanced Materials
ISET	Institute for Solar Energy Technology
ISL	Institute of Shipping Economics and Logistics
IWES	Fraunhofer Institute for Wind Energy and Energy System Technology
OTB	Offshore Terminal Bremerhaven
PFAU	Programm zur Förderung von Umwelttechniken (Program for the Promotion of Environment Engineering)
R&D	research and development
WAB	Windenergieagentur (Wind Energy Agency)
WFB	Wirtschaftsförderung Bremen GmbH (Bremen Economic Development Company)

1. Bremerhaven goes offshore

In the middle of the 1990s, Bremerhaven was on the ropes. Suffering from rapid population loss, high unemployment and numerous vacant flats and shops, the maritime port city was called "the poorhouse of West Germany" (Salot 2011: 6; translation by the author). In 2005, the unemployment rate reached its peak at 26 percent, with 14,000 people being out of work (ebd.). In order to ensure Bremerhaven's survival, the city urgently needed to develop its economy to create new jobs and stop people from leaving the town.

To achieve an extensive structural change the Senate of the State of Bremen decided the InnoVision 2010 Program in 2002 (Der Senator für Wirtschaft, Arbeit und Häfen 2002). The innovation strategy aims at making Bremen one of Germany's top ten locations for technology by 2010[1]. There are three underlying main pillars: First, existing clusters of excellence in fields of innovation are to be strengthened and new ones fostered. Second, research and development capacities and corresponding training courses in application-related fields are to be expanded. Third, a suitable environment to foster innovation is to be created (Der Senator für Wirtschaft, Arbeit und Häfen n.d.).

In regard to its locational advantages (water deep enough for maritime vessels to maneuver and maritime know-how), the Bremerhavener Gesellschaft für Investitionsförderung und Stadtentwicklung mbH (Bremerhaven Economic Development Company, BIS)[2] encouraged the then Mayor of Bremerhaven Jörg Schulz to establish an offshore wind industry (Becker/ Kellner-Stoll/ Köpke 2013: 33; BIS 2008: 7; Bremische Bürgerschaft 2003: 2, WFB 2011: 14). In summer 2002, an inter-agency task group led by the Senator of Civil Engineering, Environment and Transportation and composed of diverse resorts and associations (among those the BIS and the Wirtschaftsförderung Bremen GmbH (Bremen Economic Development Company, WFB)[3]) was established in order to pool all of the State's activities in the field of on- and offshore wind energy (Bremische Bürgerschaft 2003: 3). Only a little bit more than a year later the Senate passed the concept on the expansion of on- and offshore wind energy in Bremen and Bremerhaven (Der Senator für Umwelt, Bau und Verkehr 2003), suggesting the profiling of the state's scientific institutions, the transfer of technologies (hence forging close cooperation between businesses and science community), the acquisition of businesses in manufacturing and services, the expansion of wind energy, the development of the industrial areas Luneort in

1 The innovation strategy 2010 has later been replaced by the innovation strategy 2020. The goals basically have remained the same (for the innovation strategy 2020 see Der Senator für Wirtschaft, Arbeit und Häfen 2012a).

2 The Bremerhavener Gesellschaft für Investitionsförderung und Stadtentwicklung mbH (BIS) is responsible for the development and marketing of Bremerhaven as a center for commerce and industry (BIS 2014).

3 The WFB in Bremen is basically the counterpart to the BIS in Bremerhaven: It develops, strengthens and markets Bremen as a location for business, trade fairs and events (WFB 2014).

Bremerhaven as well as Überseestadt and Vulkan-Gelände in the City of Bremen, the conceptualization of a strategy for skills qualification and training, and an aligned marketing strategy (Bremische Bürgerschaft 2003).

The strategy paper was discussed in the Bürgerschaft[4] in April 2003 and was supported by all parliamentary parties (Becker/ Kellner-Stoll/ Köpke 2013: 39). This exceptional political consensus regarding the issue of wind energy has held its ground till today (Becker/ Kellner-Stoll/ Köpke 2013: 31; Bremische Bürgerschaft 2010b: 4614ff.; Bremische Bürgerschaft 2007a: 13).

In the subsequent years, the State of Bremen pointedly fostered cooperation between science and industry, invested in an appropriate infrastructure and granted funds to get the offshore wind industry started, giving a particular emphasis to small and middle-sized companies (Günthner 2012: 5; SPD/ Bündnis 90/Die Grünen 2011: 11). These measures have been flanked by a number of specific programs and strategies such as the Master Plan Industry, the Structuring Concept 2015 or the Cluster Strategy 2020[5]. All of those programs suggest the close interlocking of the relevant policy areas in order to ensure the sustainable competiveness of the regional economy by supporting and further developing existing local strengths (Der Senator für Wirtschaft, Arbeit und Häfen/ Die Senatorin für Bildung, Wissenschaft und Gesundheit/ Der Senator für Umwelt, Bau und Verkehr 2012: 1).

By now, the seaside town has an outstanding offshore wind cluster characterized by spatial concentration of large internationally leading concerns, supply firms, service companies, excellent scientific facilities and a great number of highly qualified employees (Prognos 2011: 46; Der Senator für Wirtschaft, Arbeit und Häfen 2012a: 17).

In the following, the development of the offshore wind industry in Bremerhaven will be described by observing each item of the 2003 strategy paper on the expansion of wind energy in detail. The order of the individual measures will be altered to the extent that the essential parameters will be presented at first before going into detail about how the offshore wind energy actually expanded. Due to a lack of space the findings presented in the following paragraphs are very condensed results and raise no claim to completeness.

4 The Bürgerschaft or Bremische Bürgerschaft is the name of the state's parliament.

5 For further programs see Der Senator für Wirtschaft, Arbeit und Häfen/ Die Senatorin für Bildung, Wissenschaft und Gesundheit/ Der Senator für Umwelt, Bau und Verkehr 2012.

2. Parameters for the expansion of the offshore wind industry

2.1 The state's scientific institutions and skills qualification and training[6]

The expansion of the scientific landscape has been central for the development of Bremerhaven as location of the offshore wind industry for a number of reasons: For one thing, at the turn of the millennium offshore wind energy was still in the very early stages of development (Becker/ Kellner-Stoll/ Köpke 2013: 32). Under these conditions it was necessary to foster research and development (R&D) and the cooperation between science and industry. For another thing, the State of Bremen wanted to ensure that appropriate research facilities and skilled workers are available for companies of the offshore wind industry that consider moving to the two city-state. As such, the profiling of its scientific landscape has been part of the State's acquisition strategy (Bremische Bürgerschaft 2003: 3).

In the aftermath of the strategy paper's release, the State of Bremen pushed forward the establishment of the Bachelor degree course 'Maritime Technologies' at the University of Applied Sciences Bremerhaven. Here, students have the possibility to specialize in the field 'Wind Energy Technology' that covers the development, construction and operation of on- and offshore wind energy turbines and wind farms (Hochschule Bremerhaven 2014). Since winter term 2009/2010, students have also been able to study 'Wind Energy Technology' as Master degree course. In close cooperation with the Bachelor 'Maritime Technologies' and the Master 'Wind Energy Technology', the Institute for Wind Energy (fk-wind) conducts applied research in the field of wind energy technology (Sauter/ Treffeisen/ Landsberg 2009: 34). Beyond that, there is a great number of further degree courses that offer research competencies and know-how relevant to the area of wind energy, such as the course 'Production Engineering' at the University of Bremen, 'Naval Architecture and Ocean Engineering' at the University of Applied Sciences Bremen and 'Transportation and Logistics' at the University of Applied Sciences in Bremerhaven (Bremische Bürgerschaft 2003: 3).

In addition to the academic training at the universities, there are various companies offering education and training in the field of offshore wind energy. The BIS, the Windenergieagentur (Wind Energy Agency, WAB), the Agency for Labor, the Arbeitsförderungszentrum (Center for Labor Promotion, AFZ) and the Bremerhavener Arbeit GmbH (Bremerhaven Association of Labor, BRAG) are continuously and intensively exchanging information and organizing a yearly job market for the wind industry (BIS 2008: 23). Beyond that, the State of Bremen has funded new advanced training schemes such as the advanced training for becoming a service technician for

6 Because of the synergies between science and education respectively skills qualification and training, item one and six of the above mentioned strategy paper will be presented collectively in the present paragraph.

wind turbines (Bremische Bürgerschaft 2003: 11f.).

In the area of research facilities the Alfred Wegener Institute (AWI), the Fraunhofer Institute for Manufacturing Technology and Advanced Materials (IFAM), the Bremen Institute for Applied Beam Technology (BIAS), the Institute of Fibers, the Bremen Institute for Production and Logistics (BIBA) plus the Institute of Shipping Economics and Logistics (ISL) all are more or less related to the offshore wind sector (Bremische Bürgerschaft 2003: 3). To enhance its R&D structures, the State of Bremen has initiated a number of funding programs such as the Programm zur Förderung von Umwelttechniken (Program for the Promotion of Environment Engineering, PFAU) and the Förderprogramm zur Angewandten Umweltforschung (Program for the Promotion of Applied Ecological Research, AUF) (Bremische Bürgerschaft 2003: 4; Sauter/ Treffeisen/ Landsberg 2009: 96). In the period 2007-2013 projects that have initially been funded under AUF became objects of the European Fund for Regional Development (EFRE). The EFRE program granted resources of up to 2.88 million euros for operational research, development and innovation programs as well as for the establishment of technology centers and scientific facilities (Der Senator für Wirtschaft, Arbeit und Häfen 2012a: 51; EFRE n.d.).

The funds have been used among other things to establish a competence center for rotor blades in 2008 as a unit of the Center for Wind Energy and Maritime Engineering (CWMT) in Bremerhaven. In the CWMT rotor blades of up to 70 meters in length can be tested and optimized (Bremische Bürgerschaft 2007b). The Federal State and the State of Bremen provided 26.4 million euros in total (Sauter/ Treffeisen/ Landsberg 2009: 29). In 2011, a second test bed came on stream which allows researchers to test rotor blades of up to 90 meters (Becker/ Kellner-Stoll/ Köpke 2013: 73). In 2009, the CWMT in Bremerhaven and the Institute for Solar Energy Technology (ISET) in Kassel merged in the Fraunhofer Institute for Wind Energy and Energy System Technology (IWES) (IWES 2014). For the five-year knock-on financing, laboratories, equipment and new buildings the Institute received 25 million euros by the Federal Ministry of Environment and 10 million euros by the State of Bremen (Sauter/ Treffeisen/ Landsberg 2009: 29). The IWES disposes of considerable testing and experimental facilities, laboratories and state-of-the-art equipment. It is nationally and internationally recognized and collaborates with various public and industrial research groups (WFB 2011: 128). From 2014 and for the first time in Germany, there will be a full scale technological test stand for complete nacelles: the Dynamic Nacelle Testing Laboratory (DyNaLab). The DyNaLab is to allow for thorough laboratory testing and the evaluation and optimization of established and future turbine concepts (IWES 2013).

A unique wind tunnel, established in 2007 by the private firm Deutsche WindGuard GmbH, tops off Bremerhaven's scientific landscape. The wind tunnel allows for testing the aerodynamic and acoustic properties of relatively large models respectively original segments of wind energy plants (BIS 2008: 23). Since December 2011, profiles of rotor blades at Reynold figures exceeding 6m can be studied in addition (Krüger/

Morris 2011).

2.2 The transfer of technologies

In order to enable a close interlocking within the wind energy business in Germany's North West region and thus exhausting synergy potentials, already in February 2002 and initiated by the BIS, the Wind Energy Agency Bremerhaven/ Bremen e.V. (WAB) was founded (Bremische Bürgerschaft 2007a: 1). The WAB acts as network of the wind energy sector in Northwest Germany and serves as nationwide address for the offshore wind industry. By now, the WAB counts more than 350 businesses and institutions among its members. Its central purpose is to organize regular get-togethers and conferences to encourage manifold exchange within the industry as well as the initiation of new projects in business and research. As for its financing, the WAB receives a base funding from the State of Bremen. All costs exceeding this are borne by its members (WAB 2014).

Also relevant in terms of technology transfer is the already above mentioned fk-wind. The fk-wind serves as research and coordination office in the field of wind energy, working in close collaboration with industry, science and education organizations (Bremische Bürgerschaft 2007b: 9).

2.3 The development of the industrial areas

Since 2001, the BIS has made available areas for the offshore wind industry, offering within very short time suitable test sites and industrial areas for the production of the wind plants (Moritz 2013). The State of Bremen spent around 17 million euros for the arrangement of storage and assembly areas in Luneort and for the alteration of the Labradorhafen port, both located in the South of Bremerhaven (Bremische Bürgerschaft 2007b: 5). When the ships that transport nacelles, rotor blades and foundations to the construction areas in the North sea became too big to lay the Labradorhafen port, the BIS adjusted the Container Terminal I (CT1) and the ABC-Halbinsel port in the North of Bremerhaven to the needs of the offshore wind industry (Becker/ Kellner-Stoll/ Köpke 2013: 118). This, however, has only been a temporary arrangement, made possible by the lack of demand in the container and automotive area following the economic crisis 2008. In the long run, this is no solution because for one thing the container and automotive industry will need the space again and for another thing the logistical expenses are too high (Schnorrenberger 2011: 19).

As a result, in 2010 the Senate decided the construction of the Offshore Terminal

Bremerhaven (OTB) on the Weser River due 2014. However, by now it is clear that the deadline will not be adhered to. Therefore, the new start of construction is scheduled for the end of 2015. Thus, the completion is not expected before 2017 (Radio Bremen 2014). Originally, the Senate intended a private investor to pay for building and operation (Der Senator für Wirtschaft, Arbeit und Häfen 2010). However, the search for an appropriate investor failed and in December 2012, the Senator for Economy, Labor and Ports announced that the OTB will be financed at public expense. The costs for the construction of the quay aggregate to 160 million euros. An additional 20 million euros has been estimated for compensation measures (Der Senator für Wirtschaft, Arbeit und Häfen 2012b). After a comprehensive examination of diverse options at three possible sites in Bremerhaven, in summer 2010 the Senate decided for the northern section 'Blexer Bogen' as location for the OTB. In the subsequent planning process various agencies and associations have been involved. The ports management company bremenports was responsible for the permission process and for the technical planning process of the object. It coordinates its activities in cooperation with the senatorial agencies in Bremen, the Bremen Department of City Planning and the BIS (bremenports 2011: 5ff.).

3. Drawing businesses to Bremerhaven

3.1 An aligned marketing strategy

When Bremerhaven suffered from high unemployment and great population loss in the 1990s, it was clear that the city must act in order to not only retain the current size of population but to draw new people and businesses. The State of Bremen and the City of Bremerhaven invested about 65 million euros in the conversion of the seaside town and in projects aimed at making the city more attractive. Also, new and livable housing was and is to be created - not least because of the numerous specialists of the offshore wind energy sector (Becker/ Kellner-Stoll/ Köpke 2013: 134ff.).

The actual marketing in terms of offshore wind energy is carried out primarily by WFB, BIS and WAB. WFB and BIS conduct among other things supra-regional location marketing and are responsible for the acquisition of companies for the locations Bremen and Bremerhaven (Bremische Bürgerschaft 2003: 15). Beyond that, the BIS participates in trade fairs and diverse networks among the offshore wind sector (BIS n.d.). In 2009, it setup the web page www.offshore windport.de to inform businesses about the Bremerhaven offshore wind industry (Sauter/ Treffeisen/ Landsberg 2009: 56). The main part of the marketing activities is carried out by the WAB. The WAB offers its members annual conferences, presents the Bremerhaven offshore wind industry at both national and international trade fairs, conducts studies, lobbying – also at federal level - and public relations and offers information on the industry such as the Offshore Wind Energy magazine or the two-monthly newsletter (Becker/ Kellner-Stoll/ Köpke 2013: 64; WAB 2014).

Already the 2003 strategy on the expansion of wind energy envisaged the creation of a trade name that presents the close connection of the City of Bremerhaven as location of the offshore wind industry (Bremische Bürgerschaft 2003: 13). The city decided for the label 'Klimastadt' (climate city). Since 2010, it has pursued the development strategy 'Klimastadt Bremerhaven' under which the ecological reconstruction of the urban society is to be advanced. The approach emphasizes the potentials of climate change and encourages citizens to join innovative projects to mitigate and to adapt to climate change (Seestadt Bremerhaven 2013: 2ff.).

The appropriate demonstration of the offshore wind energy is one of the concept's pillars. Initiated by the BIS and supported by the industry, from 2014 offshore wind energy will be an issue in the science center Klimahaus Bremerhaven 8° Ost (Climate House). A separate exhibition area is to inform about offshore wind energy in general and about the offshore wind industry and the entire value creation chain in Bremerhaven in particular. Beyond that, on the guided 'Tour de Wind'-tour citizens and tourists learn about wind energy and visit more than 20 stations that display the offshore wind industry in Bremerhaven, such as the production sites of the turbine,

rotor blade and foundation manufacturers, the Falck Safety Service training center and the offshore terminal ABC-Halbinsel port. Opposite of the ABC-Halbinsel port there's an observation deck allowing for a good view of the offshore terminal. In addition to that, Bremerhaven provides the 'Wind-Stadt-Plan', a special map that leads along test plants and production sites and offers useful information on offshore wind energy (Becker/ Kellner-Stoll/ Köpke 2013: 141f.).

3.2 The acquisition of businesses in manufacturing and services

In order to draw manufacturers of wind energy plants to the seaside town, the BIS made use of specific acquisition measures such as the provision of knock-on financing and appropriate R&D structures (see chapter 2.1). Beyond that, already located companies in the maritime area and in the steel production were encouraged to diversify their activities towards maritime offshore technologies (Sauter/ Treffeisen/ Landsberg 2009: 53). In close cooperation to the activities of the BIS and the WAB, the WFB has focused on the acquisition of service companies and producers of small–sized plants in the City of Bremen (Bremische Bürgerschaft 2003: 6). Thus, companies along almost the entire value creation chain could be acquired for the State of Bremen (Prognos 2011: 46).

In the last ten years a number of large companies that are concerned with the manufacturing of offshore wind energy plants have founded production sites in Bremerhaven. Among those, there are two large producers of offshore wind turbines (AREVA Wind GmbH, 2003/2004 and REpower Systems SE, 2007), one company specialized in manufacturing rotor blades (PowerBlades GmbH, 2008) and one foundation fabricator (WeserWind GmbH Offshore Construction Georgsmarienhütte, 2003) (Sauter/ Treffeisen/ Landsberg 2009: 53). Beyond that, external suppliers, businesses in service, maintenance and repairs as well as firms that deal with the logistics, installation and assembly of wind energy plants have located in Bremerhaven (Prognos 2011: 88). Since 2011, the seaside town also disposes of the Falck Safety Service training center where offshore wind energy specialists are trained for the case of extreme situations occurring at work on the high sea (Moritz 2013). Specific building components that are not available on site such as towers, hubs and gears are supplied by companies in the region and in West and South Germany (Prognos 2011: 88f.).

4. The expansion of offshore wind energy

4.1 Bounding strides ahead

The German Federal Government has set a goal of reducing greenhouse gas emissions by 80 percent of 1990 levels by the year 2050. In order to reach the figure, an expansion of renewable energies is absolutely necessary (Bremische Bürgerschaft 2010a: 1). Against this background the German Federal Government passed the Erneuerbare Energien Gesetz (Law on Renewable Energies, EEG) in 2000 that promotes renewable energy mainly by stipulating feed-in tariffs that grid operators must pay for renewable energy fed into the power grid (BMUB 2000). Beyond that, in 2006 the Infrastrukturbeschleunigungsgesetz (Law on the Acceleration of Infrastructures) was released that provides for the costs of grid connection to be borne by the operators of the transmission networks. This rule applies to all offshore wind farms whose construction has started before December 31st, 2011 (Bremische Bürgerschaft 2007b: 11). With that said, the legal parameters were set for the expansion of wind energy in Bremerhaven (Bremische Bürgerschaft 2007a: 13).

In 2003, the State of Bremen went to action: For one thing, the two city-state has made EU-notified promotion programs available to support wind energy companies (Bremische Bürgerschaft 2003: 6f.). For another thing, Bremerhaven has funded projects on a company by company basis and has conducted active project financing. In total, the State of Bremen allocated around 13.32 million euros for the promotion of offshore wind projects in the period 2001-2006. Private investments amount to roughly the same amount. This systematic strategy of funding has paid off: Today, Bremerhaven disposes of a unique offshore wind energy cluster (Bremische Bürgerschaft 2007a: 4f.).

One of the two central turbine manufacturers that the BIS has drawn to Bremerhaven is the Multibrid GmbH. In 2004, the company designed "exclusively […] for offshore conditions" (WFB 2011: 46; translation by the author) the first turbine of type M5000 with a net output of 5 megawatts. In 2006, the company completed its second prototype – the worldwide first wind energy plant built on a three-legged foundation (tripod) was established. When the French concern AREVA purchased the majority of the Multibrid GmbH in autumn 2007, Multibrid, now called AREVA Wind GmbH, started to expand its activities (Becker/ Kellner-Stoll/ Köpke 2013: 85ff): The company build a new production hall of 3,500m² in seize, receiving a grant by the State of Bremen of 1.19 million euros. Shortly afterwards, AREVA started mass production (Bremische Bürgerschaft 2007a: 4). In 2008, two further wind plants of type M5000 were connected to the grids. In 2009, the first six AREVA wind turbines have been put up in the test field alpha ventus[7]. Beyond that, AREVA currently constructs 80 wind

7 The alpha ventus test field, north of the Northern Sea island of Borkum, consists of 12 plants with 5 megawatts capacity each, bringing a

energy plants for the planned offshore wind farm Global Tech I and 40 turbines for the Trianel wind farm Borkum[8] (Becker/ Kellner-Stoll/ Köpke 2013: 93f.).

In July 2013, the installation vessel MPI Adventure started the installation of the turbines at the wind farm Borkum. 25 turbines have been installed so far and 75 percent of cabling is completed (Effective March 2014). All 40 wind turbines are expected to start operating in 2014 (Trianel 2014). With an overall capacity of 200 megawatts the wind farm Borkum will then be able to supply about 200,000 households with eco-electricity. Another 40 AREVA Wind M5000 turbines are envisaged for the second installation phase (IWR/ Stiftung Offshore-Windenergie 2014b).

At the offshore wind farm Global Tech I, located approximately 180 kilometers from Bremerhaven in the German North Sea, the 40th AREVA Wind turbine M5000 was installed in April 2014 (Global Tech I 2014). At time of its completion the wind farm will consist of 80 wind turbines delivering electricity for an equivalent of 445,000 households. It is one of the first commercial offshore wind farms in the North Sea (Global Tech I 2012a).

The foundations, on which the AREVA turbines at the wind farms Global Tech I and Borkum are erected, have been produced by WeserWind GmbH Offshore Construction Georgsmarienhütte (Global Tech I 2012b). WeserWind has specialized on the design, construction and installation of special foundation structures for the offshore wind sector. The company's product line includes jacket-, tripod- and monopole structures as well as transformer stations and complete met mast systems (WFB 2011: 68). Since 2003, the company is located in Bremerhaven. In 2008, it expanded its production site, starting the construction of a new production hall measuring 45,000m² in total (Becker/ Kellner-Stoll/ Köpke 2013: 99ff.).

Attracted by the opportunity of a test site for offshore wind turbines, the turbine manufacturer REpower Systems SE[9] moved to Bremerhaven in December 2007. In the following spring, the company built a rotor blade factory, creating 500 new jobs. In 2008, REpower started to increase its production, manufacturing six offshore wind plants of type 5M (capacity: 5 megawatts) for the test site alpha ventus and an additional three machines of type 6M (capacity: 6,15 megawatts) for the onshore wind farm Westre at the North Frisian-Danish border. All nine wind turbines went into operation in 2009. Till summer 2013, REpower has constructed 139 wind turbines in total from which 54 turbines are operating offshore (Becker/ Kellner-Stoll/ Köpke 2013:

total performance of 60 megawatts. In their first year of operation in 2011, the systems produced 267 million kilowatt hour – 15 percent more power production than expected. The project was realized by the consortium Deutsche Offshore-Testfeld und Infrastrukturgesellschaft (DOTI), which comprises the energy companies EWE, E.ON Climate and Renewables and Vattenfall Europe Windkraft (IWR/ Stiftung Offshore-Windenergie 2014a).

8 The wind farm Borkum, which is a mutual project of the Trianel GmbH and 33 municipal and regional energy supply companies, is located 45 kilometers to the north of the German island of Borkum. Eventually, it will hold 80 wind turbines anchored to the seabed (Trianel 2014).

9 Since 2014, the REpower Systems SE is named Senvion SE (DPA 2014). Nonetheless, in the following the company will be referred to by its former name REpower.

95ff.). 48 further wind turbines for the German wind farm Nordsee Ost[10] are completed and are to be erected and connected to the grids by the energy supplier RWE Innogy in 2014 (RWE Innogy 2014).

The rotor blade manufacturer PowerBlades GmbH completes the quartet. For the erection and equipment of its rotor blade factory and for the associated research and development processes the company received funds from the European Union (Senvion 2014).

4.2 Stepping backwards?

What seems like a story of consistent success undergoes rough times currently. Up to mid-2013, in the North and East Sea only 89 wind turbines fed power of less than 400 megawatts in total into the grids. The 2011 expanded production hall of REpower is not working to capacity (Becker/ Kellner-Stoll/ Köpke 2013: 63ff.). Thus, the turbine manufacturer has dismissed several hundred employees. Also, AREVA has announced job cuts – at least temporary. While 660 people work for AREVA today, it will be only 500 at the end of the year 2014. WeserWind joins the austerity measures and banks on short-time working (Zier 2014).

These cuts are the natural reaction to the current lack of contracts. Reason for the lull is the uncertain future allowance of renewable energies and thus the missing planning certainty for investors (Bremische Bürgerschaft 2013a: 2599; Bremische Bürgerschaft 2013b: 1). Currently, the EEG is being reformed. While up to now, under the EEG 19 cent per kilowatt hour of electricity obtained from offshore wind energy is paid, this model will expire in 2017. According to the 2014 bill, the German Federal Government will pay less money for offshore wind energy in the near future: In 2018 and 2019 the remuneration will be shortened by one cent each. If the Federal Parliament and the Federal Council of Germany approve the bill, a great number of notified projects will not be realized (Senatskanzlei 2014).

10 The wind farm Nordsee Ost is located around 35 kilometers to the north-east of the island of Heligoland in the German North Sea region and will have a total output of around 295 megawatts (RWE Innogy 2014).

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