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Repowering Strategies for Wind Farms in Northern Germany
-
A Feasibility Study

A Master's Thesis submitted for the degree of
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Affidavit

I, **STEFAN JANSEN**, hereby declare

1. that I am the sole author of the present Master's Thesis, "REPOWERING STRATEGIES FOR WIND FARMS IN NORTHERN GERMANY - A FEASIBILITY STUDY", 129 pages, bound, and that I have not used any source or tool other than those referenced or any other illicit aid or tool, and
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I. Abstract

The German energy supply shall be changed from a fossil-fuel and nuclear energy based to a regenerative energy based supply. For a successful implementation of the energy turnaround, the repowering of existing wind farms is deemed one of the major cornerstones. Due to shrinking numbers of suitable locations for Greenfield projects, the Renewable Energy Sources Act provides repowering incentives in the form of a repowering-bonus to promote the replacement of inefficient wind turbines, commissioned prior to 1 January 2002, by state-of-the-art technology.

Despite repowering incentives and increased efficiency of modern wind turbines, the feasibility of repowering projects is not necessarily guaranteed. On the basis of two case studies on existing wind farms in northern Germany, the thesis demonstrates that numerous factors have an impact on the realisation of repowering projects. A repowering of an existing wind farm inevitably changes the original conception of the underlying wind energy fund and can negatively affect the rights of the actual investors. Both case studies show that potential repowering decisions lead to additional financial burdens for the repowering projects due to necessary compensation payments to the existing investors.

Using consistent financial parameters within the framework of profit and loss forecasts, as well as applying accepted methods of financial mathematics, the feasibility studies on two different types of wind turbines allow for meaningful evaluations by comparing financial ratios. The study reveals that the realisation of both repowering projects strongly depends on the type of installation. Especially at the stronger wind location Sustrum, the entitlement to the repowering-bonus is not the key factor for the feasibility of the project. Rather, the potential annual energy production at the respective project site in combination with the level of investment costs per wind turbine is the crucial factor for a successful implementation.

Keywords: Wind farms, Repowering strategies, Renewable Energy Sources Act (EEG), Feasibility Study

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IV. List of Abbreviations

cum	-	cumulative
DM	-	Deutsche Mark
EEG	-	Erneuerbare-Energien-Gesetz (Renewable Energy Sources Act)
EU	-	European Union
GW	-	gigawatt
IEA	-	International Energy Agency
kV	-	kilovolt
kWh	-	kilowatt hours
MSW	-	municipal solid waste
MW	-	megawatt
MWh	-	megawatt hours
Pf	-	Pfennig
PSC	-	power supply company
TWh	-	terawatt hours
WT	-	wind turbines
m/s	-	meters per second

1. Introduction

The industrial civilisation is at a crossroads. Oil and other fossil fuel energies still account for largest part of the worldwide energy supply. Although the adverse effects on the climate have already been identified in the 1980's, the economies in the world are still excessively dependent on fossil fuels in order to carry out virtually every commercial activity such as transport, generating power, heat or light. However, these energy sources are dwindling. According to numerous scientists the entire industrial infrastructure currently built on the back of fossil fuels is aging and in disrepair. The dwindling reserves of crude oil for instance, lead to increasing oil prices with severe economic consequences for the industry and private consumers. In July 2008 the price of crude oil on the world markets peaked at a record of $ 147.00 per barrel (Mouawad, 2009). Another crucial factor is the unjust distribution of energy supplies with sources of fossil fuels in the hand of only a few economies. Thus, some economies depend strongly on the energy supply of others and become not only economically, but also politically depended. Additionally, the energy generation from non-fossil sources such as nuclear power is heavily disputed due to its environmental risks. Serious nuclear accidents as the Three Mile Island accident in the U.S., the Chernobyl accident in the former Soviet Union or the recent nuclear meltdown of reactors in Fukushima, Japan, have revealed the potential hazard of nuclear energy. Further, the final disposal of nuclear waste is still a matter under discussion since the handling and disposal will have an unpredictable environmental impact which inevitably concerns future generations.

In order to counteract the aforementioned economic and environmental pressures, the German Federal Government recently announced a new energy concept with the objective to change the energy supply from a fossil-fuel and nuclear energy based to a regenerative energy based supply (Bundesregierung, 2011). To achieve this ambitious target, the potentials of all regenerative forms of energies must be tapped. This includes wind, sun, bioenergy and geothermal energy (BMU, 2012a). Especially the development of wind energy deployment in Germany over the last twenty years is impressive. By midyear 2012, the total number of wind turbines has already reached 22,594 with a total installed capacity of 30,001 MW (DEWI, 2012). However, to maintain the rapid development of wind energy, not only new suitable locations, onshore and offshore, are required, but also the replacement of older and smaller installations with reduced output by modern and more powerful ones, a process known as repowering (BMU, 2012a). In the near future the concept of repowering will gain in importance since more and more German wind farms are aging. Today the majority of operating wind turbines in Germany has a relatively low power output of 500 to 600 kW compared to state-of-the-art technology and were already installed between 1996 and 2004. Since then technology has significantly increased in efficiency, reaching an average power output of 2 MW for newly installed wind turbines (Demus, 2009).

By only taking into account the increased efficiency of state-of-the-art wind turbines, one could jump to the conclusion that all repowering projects are economically feasible. In order to be able to prove this hypothesis right or wrong, this thesis aims at conducting a profound feasibility study for two different repowering projects of the wind farms in Sustrum and Ohne, both located in northern Germany and operated by the project developer WnE GmbH (Windpark nördliches Emsland).

Before the actual case study is carried out, the study begins with a brief introduction of the recent development and the future challenges of the global and European energy supply. Subsequently, the current mix of the German electricity supply, the consequences of the Fukushima Daiichi nuclear disaster and the intended pathway to a regenerative energy based supply will be discussed in more detail. After having introduced the overall context of the global and European energy supply as well as the ensuing German energy turnaround plan, an economic and ecological analysis of the German wind energy sector will be conducted to highlight its future potential. The legal and political framework is of significant importance with respect to the future potential of wind energy in Germany and serves as a tool to offer economic incentives for the installation of Greenfield and repowering projects. Therefore, the evolution and the adaptation of the legal framework, the so called Erneuerbare-Energien-Gesetz (EEG), will be elaborated.

2. Methodology

As indicated in the introduction, the feasibility study constitutes the central part of the thesis. Both projects, the repowering of the wind farm in Sustrum and the expansion of the wind farm in Ohne, entail particular additional financial burdens affecting their feasibility. These particularities, which will be discussed in detail in the respective case studies, complicate the comparability of the repowering projects with regard to their financial performance. In addition, not only the comparability between both repowering projects, but also within the individual project proves to be difficult since the feasibility will be tested on two different types of wind turbines.

Hence, consistent financial parameters within the framework of profit and loss forecasts are required for the financial and feasibility analyses of each repowering project. With respect to the development of the operational costs, an annual inflation rate of 3 % is assumed. This value is based on the historical development of the rate of inflation in Germany (WID, 2013). Since a forecast should be calculated conservatively, a certain risk premium to buffer a potential increase of the inflation level is included. Further, accepted methods in financial mathematics are applied to guarantee comparability. The depreciation method to be used is based on a ruling from the German Federal Fiscal Court (Bundesfinanzhof) as from 14 April 2011 (BFH, 2011). Accordingly, all wind farms are depreciated on a straight-line basis applying an economic lifetime of 16 years. A consistent approach regarding the financing of the total capital costs is ensured by assuming that loan capital is acquired in the form of instalment loans. Thus, the annual instalment consists of a constant repayment and a gradually decreasing interest payment over the duration of the loan (TEIA, 2013).

Future cash flows will be adjusted by the net present value method in order to derive the correct time value. The respective formula writes

$$\boldsymbol{K_0} = \frac{\boldsymbol{K_1}}{(\boldsymbol{1}+\frac{\mathbf{p}}{\mathbf{100}})^{\boldsymbol{n}}} \qquad (2.1)$$

where K_0 denotes the net present value, K_1 the future cash flow, p the discount rate and n the time of the cash flow in years (Richard and Schwitala, 2003). Since the level of the discount rate in connection with the underlying time period is crucial in this respect, the choice is based on discount rates published by the German Central Bank as from 31 March 2013 (DBB, 2013).

In addition to the aforementioned mathematical methods, further framework conditions have to be set to provide meaningful and comparable feasibility studies. While the investment costs for wind turbines are based on official offers from Enercon and General Electric (GE), the remaining capital and operating costs are based on estimations. Due to the early stage of the project development, concrete data for the costs involved is not yet available. Therefore, the expected investment costs and annual operational costs are based on experiences gathered from the cost structure of former wind energy projects of WnE. Similarly, a professional wind analysis is only available for the project site in Ohne. In order to compile the profit and loss forecast for the repowering project in Sustrum, the determination of the expected annual energy production will be deduced from the wind potential in Ohne and will be adjusted to the specific conditions at the project site in Sustrum.

Following the approach of consistency, the feasibility of the specific repowering projects in Sustrum and Ohne can be evaluated. The above-mentioned framework leads to comparable outcomes in the respective investment structure and in the profit and loss forecasts. Based on these outcomes, financial ratios such as the total investment costs per kWh, the maximum cumulative cash distribution throughout the project's life and the annualised excess cash distribution paid to limited partners can be calculated. The resulting values serve as an excellent tool to evaluate and compare the particular performances across various diverse projects.

Yet, it should be noted that a generalisation of the research findings is deemed to be difficult due to the small sample size of only two case studies. Although comparability of the financial performances of the repowering projects is provided by applying accepted methods in financial mathematics, more wind energy projects in northern Germany, encountering similar business problems, would have to be examined to generalise the outcomes and to give objective recommendations.

3. Status Quo and Trends in the Global Energy Mix

As already indicated in the introductory part of this study, the global energy regime is primarily reliant on fossil fuels. According to the statistical review of world energy, conducted by British Petrol (BP) in June 2012, oil, coal and natural gas accounted for 87 % of the global primary energy consumption in 2011, whereas renewable energy sources including hydroelectricity only accounted for 8 %. The remaining 5 % were generated by nuclear energy as can be derived from Figure 3.1. By having a closer look at the consumption patterns, it can be observed that oil, with a total share of 33 %, remains the leading fuel in the world, followed by coal and natural gas with a share of 30 and 24 %, respectively. Compared to other fossil fuels, the oil sector showed the weakest growth rate (0.7 %) and reached 88 million barrels

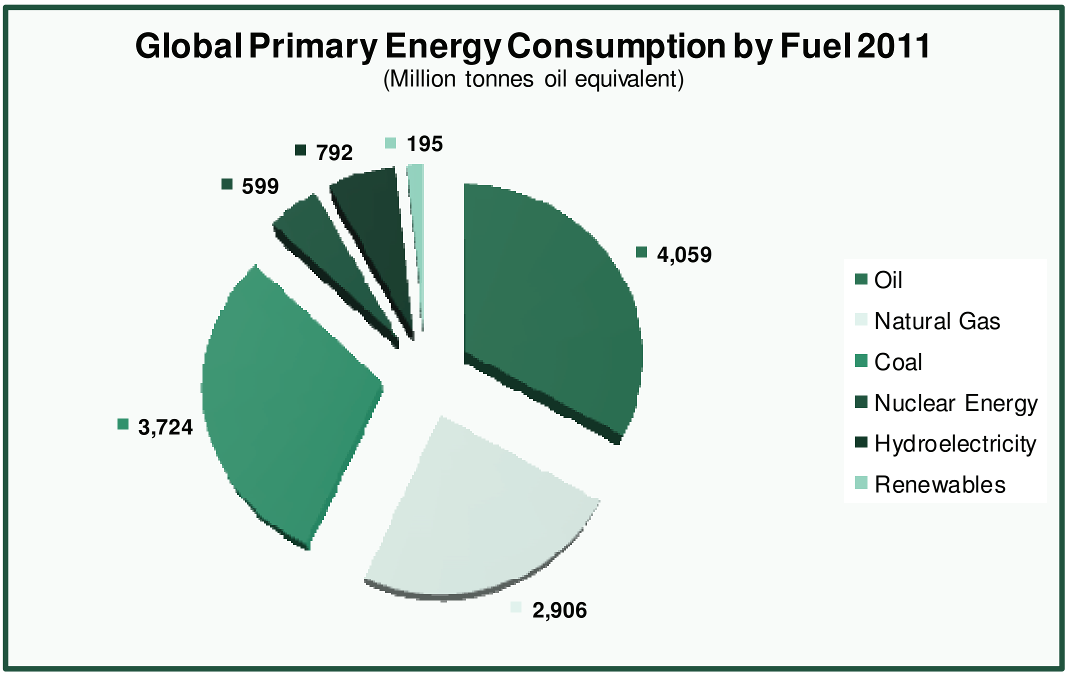


Figure 3.1: Global Primary Energy Consumption by Fuel 2011 (BP, 2012)

per day by the end of 2011. In contrast to the weak growth of oil, global natural gas consumption grew by 2.2 % and coal consumption even by 5.4 % compared to the year 2010 (BP, 2012). The remaining energy sectors including hydroelectricity, nuclear energy and renewable energy sources developed differently throughout the year 2011. While hydroelectric output grew by 1.6 % on a global scale, nuclear energy fell by 4.3 % due to significant declines in Japan (-44.3 %) and Germany (-23.2 %) as a consequence of the nuclear disaster in Fukushima. The growth rate of the renewable sources was ambivalent. Renewable energy used in power generation such as wind (+25.8 %) and solar power (+86.3 %) grew rapidly and averaged at a growth rate of 17.7 %, whereas global biofuel production almost stagnated and accounted for a relatively weak growth rate of approximately 0.7 %. By the end of the year 2011, the total renewable energy sector reached a share of 2.1 % of the global energy consumption (BP, 2012).

The analysis of the primary global energy consumption above clearly indicates that the economies in the world are heavily reliant on fossil fuels, although the share of renewable energy sources has experienced a sharp increase in the recent past. Nevertheless, the dependence on fossil fuels will have significant economical and political impacts in the future since the sources are unequally distributed. Figure 3.2 illustrates how the proved reserves of oil, which can be potentially extracted in the future from known reservoirs under existing economic and operating conditions (Rechberger, 2012), are distributed globally and shows the oil production in the year

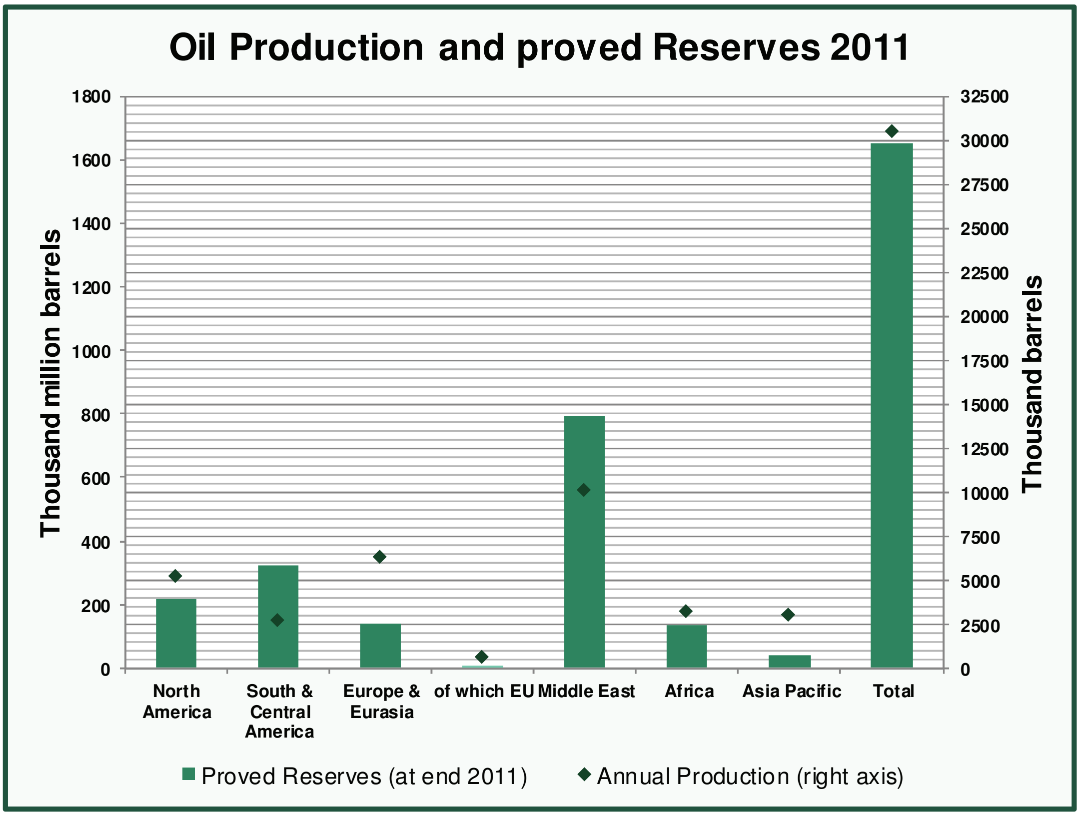


Figure 3.2: Oil Production and proved Reserves 2011 (BP, 2012)

2011. By analysing the data shown in the graph, important conclusions can be drawn. Firstly, the largest share of the proved oil reserves at the end of 2011 is located in the Middle East (795 thousand million barrels) followed by South and

Central America (325.4 thousand million barrels) and North America (217.5 thousand million barrels), while Europe and Eurasia (141.1 thousand million barrels), Africa (132.4 thousand million barrels) and Asia Pacific (41.3 thousand million barrels) only hold a minor share of global reserves. The total global proved reserves accounted for 1652.6 thousand million barrels at the end of 2011. Secondly, the data given in the graph can be used to calculate the reserves-to-production ratio of oil on a regional and global scale. Assuming that the proved reserves and the annual production of oil stay at constant levels, the global reserves-to-production ratio would show a value of approximately 54 years (BP, 2012), meaning that the entire oil reserves would be depleted within half a century. In Europe and Eurasia including the oil-rich countries Russian Federation and Kazakhstan, the oil would be depleted in about 22 years. An isolated view on the availability of oil in the EU reveals that all reserves would be depleted in 11 years (BP, 2012), emphasising EU's strong dependency on foreign oil imports.

In contrast to the oil supply distribution, the natural gas reserves can primarily be found in Europe and Eurasia as well as in the Middle East, whereas other regions such as North, South and Central America, Africa and Asia Pacific lack natural gas sources. Figure 3.3 illustrates the current natural gas production and the proved reserves at the end of 2011. Again, the data can be used to calculate the reserves-to-production ratios for the respective regions. Assuming the global actual reserves and production rates to stay constant, the total amount of natural gas would be depleted in about 64 years. Despite relatively high production rates of natural gas in the Middle East, Europe and Eurasia, the depletion of natural gas would be reached in 152 and 76 years, respectively (BP, 2012). Consequently, an abundance of natural gas in these regions can be expected in the near future, resulting in a strong bargaining power compared to gas-poor economies. However, the natural gas reserves of the EU excluding the abundant reserves of Russia and Turkmenistan are very small, leading to a depletion of its reserves in about 12 years. Similar severe economic and political consequences as for the diminishing oil reserves in the EU can be forecasted for EU's lacking natural gas reserves. While the EU primarily sources the required oil from the Middle East (126 million tonnes in 2011), the largest share of imported natural gas (117.1 billion cubic metres in 2011) is imported from Russia (BP, 2012).

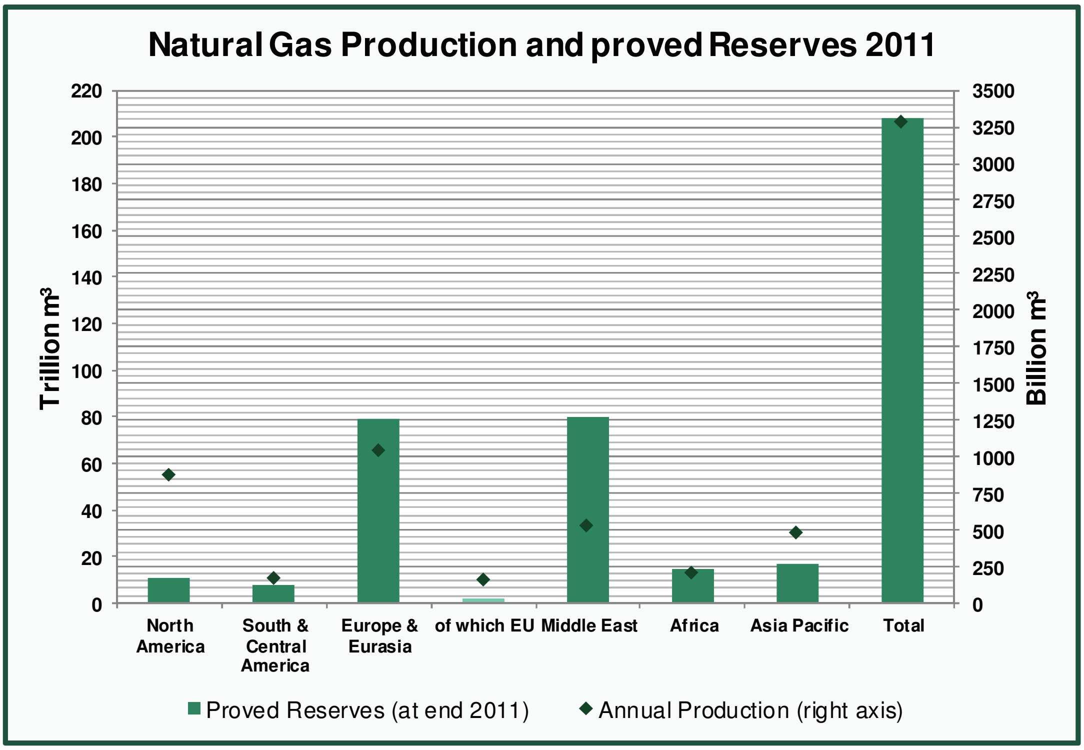


Figure 3.3: Natural Gas Production and proved Reserves 2011 (BP, 2012)

The last source of fossil fuel to be discussed is coal. In contrast to the distribution of oil and natural gas reserves, the distribution of coal shows a different pattern. Figure 3.4 below, showing the coal production and proved reserves in 2011, depicts that the largest part of the global coal reserves is owned by Europe and Eurasia (304,604 million tonnes) followed by Asia Pacific (265,843 million tonnes) and North America (245,088 million tonnes). A considerable share of about 6.5 % of the global coal reserves is held by the EU, thus serving as one of the most important energy sources in this region. Further, compared to oil and natural gas, the reserve-to-production ratios reveal a longer time frame before depletion. Assuming that the actual reserves and production rates stay constant, North America's reserves would last for another 228 years, Europe and Eurasia's reserves for another 242 years and EU's reserves for another 97 years. On a global average the coal reserves will last for approximately 112 years.

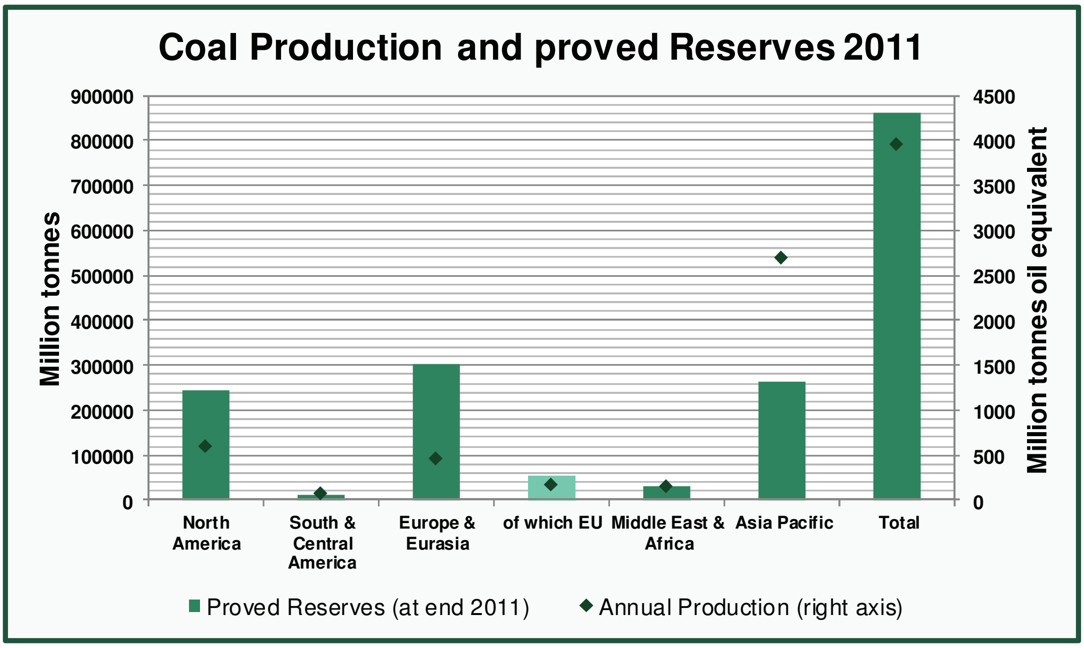


Figure 3.4: Coal Production and proved Reserves 2011 (BP, 2012)

After having analysed the status quo of the global energy mix as well as the fossil fuel production and the respective proved reserves on a regional scale, the prospects and its consequences will be briefly discussed in the following. According to the International Energy Agency (IEA), the demand for energy services and mobility will further increase by one-third from 2010 to 2035 due to global population growth and an expected annual average economic growth of 3.5 % (IEA, 2011). This outlook raises the question how the increased demand can be satisfied in the future whilst taking into account the negative environmental impacts of fossil fuels. In the world energy outlook conducted by the IEA in November 2011, three different scenarios were modelled. All scenarios expect fossil fuels to remain the dominant sources of energy in 2035.

For the oil sector, transport will remain the main driver of demand due to an increase of demand for personal mobility and freight as a consequence of economic growth. Along with the increased demand for oil, oil prices are expected to rise, leading to a strong incentive to increase efficiency or to substitute fuel (IEA, 2011). While the transport sector almost relied entirely on oil-based fuel in 2010 (93 %), new technologies such as electric vehicles will emerge and enter the market as soon as they are commercially viable (IEA, 2011). Several countries including the United States, China, France, Austria or Germany adopted country targets with the intention to increase the share of electrical cars to 8 % of the global passenger light-duty vehicles sales and to 2 % of the global stock by 2020 (IEA, 2011).

With regard to electricity, all three scenarios project demand to increase steadily between 2009 and 2035, starting from 17,200 TWh in 2009 and ranging from 28,321 to 34,352 TWh in 2035, depending on the extent to which more energy-efficient technologies will be implemented in the future (IEA, 2011). Global electricity generation is prospected to range between 32,224 and 39,368 TWh in 2035, depending on the economic growth rate between 2009 and 2035. In order to reconcile the security of energy supply on the one hand and the government targets to reduce greenhouse-gas-emissions on the other hand, a change in the energy mix will be required. Especially the global renewable energy sector will grow significantly and is expected to triple from 3,900 TWh in 2009 to 11,100 TWh in 2035. In the EU wind energy will play an important role to increase the share of renewable energy generation and is projected to increase from about 80 GW in 2010 to more than 300 GW in 2035 (IEA, 2011).

As one of the leading economies in the world, the EU introduced a climate and energy package in 2009 with the objective to meet its ambitious climate and energy targets for 2020. These targets are known as the 20-20-20 targets and include three key objectives, namely a 20 % reduction of the greenhouse gas emissions compared to 1990 levels, an increase of the share of energy consumption produced from renewable energy sources to 20 % and a 20 % improvement of the energy efficiency (European Commission, 2012). In order to meet the EU target of increasing the share of renewable energy sources by 2020 as a whole, EU Member States took responsibility by adopting national targets. These targets reflect the different starting points of different Member States and will help to reduce the greenhouse gas emissions as well as to reduce the economical and political dependence on imported energy (European Commission, 2012).

4. The Energy Turnaround ("Energiewende") in Germany

At the end of 2010, thus before the nuclear disaster in Fukushima, the electricity mix in Germany was primarily based on fossil fuels. About 55 % of the electricity was generated from lignite, coal and natural gas as can be seen from Figure 4.1. Besides the large share of fossil fuels, nuclear energy had the second largest share in the electricity mix and ensured about 22.5 % of the electricity supply. Minor sources of electricity generation were fuel oil, refinery gas and waste (4.5 %) as well as pump hydro storage (1.1 %). Renewable energy sources already supplied a large part of the total electricity in Germany (16.9 %). While wind energy (37.4 %) and biomass (32.7 %) had a considerable proportion in the renewable sector, photovoltaic (10.2 %) and run-of-the-river as well as pump storage hydro energy (19.7 %) played a minor role.

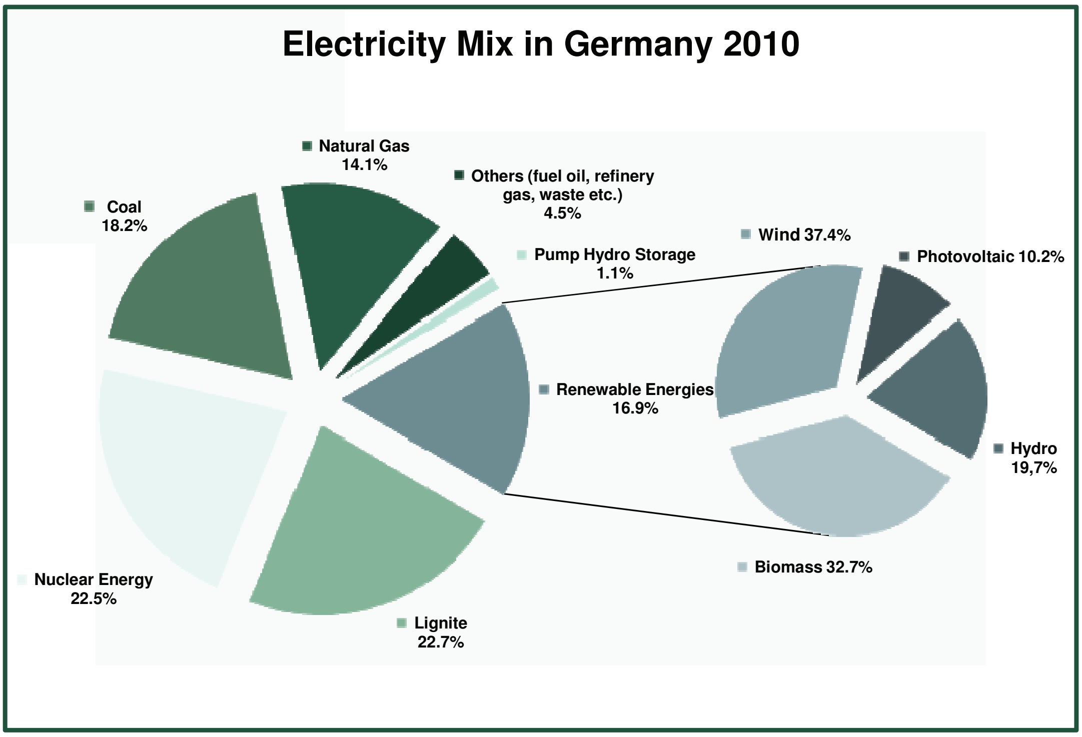


Figure 4.1: Electricity Mix in Germany 2010 (Umweltbundesamt, 2012)

On the day of the Fukushima Daiichi nuclear disaster in March 2011, the German Federal Environment Ministry established an action committee to provide important information on potential nuclear meltdowns and to clarify the involved risks for the German population. Three days after the incident (on 14 March 2011), the government and the responsible governors of the five federal German states, where nuclear reactors were located, agreed on a compulsory security check, the so-called "stress test", for all German nuclear reactors. Additionally, an ethics commission discussed how a safe energy supply could be realised considering the devastating consequences of the reactor meltdown in Japan. Despite the nuclear disaster the commission declared on 30 May 2011 that the risks of using nuclear energy in Germany had remained unchanged. However, the perception of these risks in wide sections of the population had changed considerably so that it was recommended to constrain the commercial use of nuclear energy to generate electricity. Finally, on 30 June 2011 the German Bundestag decided on the immediate closedown of the seven oldest nuclear reactors and on a stepwise shutdown of the remaining nine nuclear power plants by the year 2022. The respective law entered into force on 6 August 2011 (BMU, 2012b).

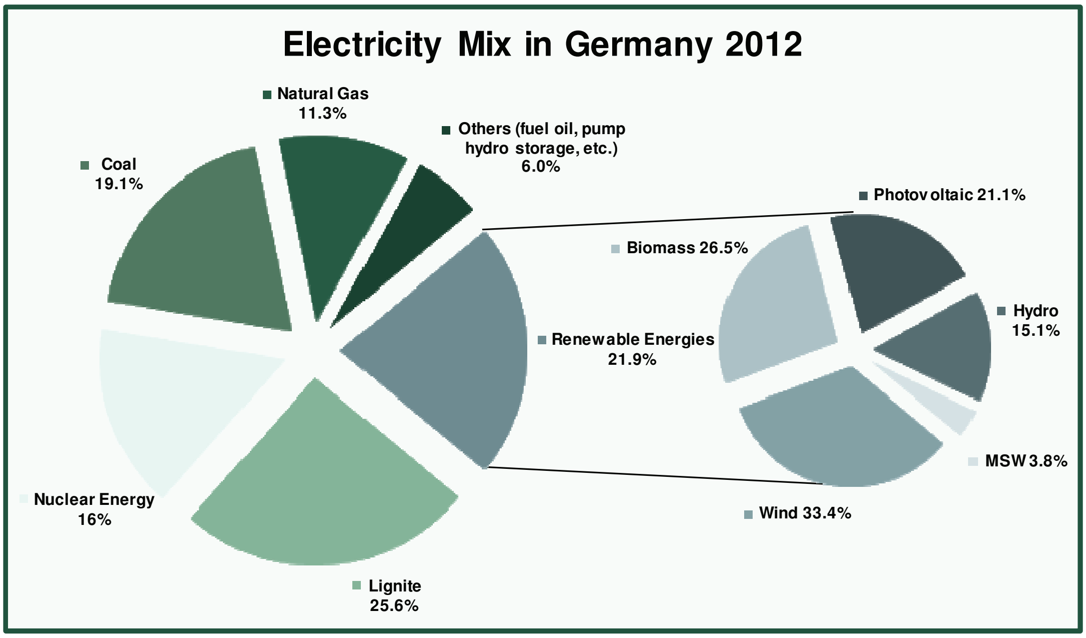


Figure 4.2: Electricity Mix in Germany 2012 (BDEW, 2013)

As a consequence of the nuclear power phase-out, the German electricity mix has already undergone a rapid change from the end of 2010 to the end of 2012, which can be seen in Figure 4.2. According to the German Association of Energy and Water Industries (BDEW), the share of nuclear energy in the electricity generation dropped from 22.5 % before the Fukushima Daiichi disaster at the end of 2010 to 16 % by the end of the year 2012. While the proportion of the natural gas sector in the electricity generation declined from 14.1 % to 11.3 %, the share of lignite increased from 22.7 % to 25.6 % and partly compensated the lost capacity due to the nuclear power phase-out. The sharpest proportional increase has been realised in the renewable energy sector. In 2010 renewable energies accounted for 16.9 % of the total electricity generation and have increased to 21.9 % by the end of 2012. The abrupt rise was primarily caused by a significantly increasing share of photovoltaic (10.2 % of the total renewable energies in 2010 to 21.1 % in 2012) and a jump from 11,683 GWh generated electricity in 2010 to 27,600 GWh in 2012 (BDEW, 2013). Although the proportions of wind, biomass and hydro power of the renewable sector declined due to the increasing photovoltaic sector (wind from 37.4 to 33.4 %, biomass from 32.7 to 26.5 % and hydro power from 19.7 to 15.1 % of total renewable energies), the nominal electricity generation of these renewable energy forms has increased as well. Hydro power experienced a slow rise from 20,956 GWh in 2010 to approximately 21,200 GWh in 2012. On the contrary, the electricity generation from wind power accounted for 37,789 GWh in 2010, while it accounted for approximately 46,000 GWh in 2012 (BDEW, 2013).

The analysis of the German electricity mix in 2010 and 2012 and the underlying consequences of the nuclear disaster in Fukushima indicate that Germany's government intends to further increase the share of renewable energies. In June/July 2011 this was identified as being one of the major cornerstones for the accomplishment of the German energy transformation. In order to compensate for the step-by-step nuclear power phase-out until 2022, the total share of renewable energies in the gross electricity consumption is targeted to account for at least 35 % by 2020 at the latest, 50 % by 2030, 65 % by 2040 and 80 % by 2050. Further, it was clearly defined that wind energy will serve as a central building block in order to achieve the ambitious goals (BMU, 2011a).

5. An Analysis of the German Wind Energy Sector

In the following sections of this thesis the German wind energy sector will be analysed economically and ecologically in more detail in order to stress its importance in achieving the short-term, medium-term and long-term goals of the energy transformation in Germany.

5.1. Recent growth and status quo

The implementation of the electricity feed-in law in 1991 signified the starting point of the wind energy sector in Germany, which guaranteed the feed-in and a competitive compensation for the electricity fed into the grid based on available market prices (KPMG, 2009). Back then, mostly single wind turbines in wind-rich coastal regions were built by limited commercial partnerships or farmers, before technological advancements and further market incentive programs by the government led to a rapid growth of the wind energy sector until today. After the coming into force of the Erneuerbare- Energien-Gesetz (EEG) in the year 2000, fixed feed-in tariffs were granted for the first time, leading to a significant expansion of wind energy in Germany (KPMG, 2009). According to DEWI, the German Wind Energy Institute, and Deutsche WindGuard GmbH (DWGG), the total number of wind turbines has increased by 49.67 % from 2003 to the end of 2012 as can be seen in Figure 5.1.1. However, it should be noted that the number of yearly installed wind turbines shows a negative trend throughout the past decade. In 2010 a temporary low, in terms of installations per year, was reached (754), before a slight increase of yearly installations could be recorded again in the following two years (895 in 2011 and 998 in 2012). The negative trend of new installations per year can be explained by a lack of appropriate areas for wind turbines as the most viable project sites in strong-wind regions were already crowded. In order to stimulate a further growth of the wind energy sector, the designation of new appropriate areas will be needed (Stohlmeyer, 2013).

Along with the continuous expansion of wind energy in Germany, the wind turbine technology increased its efficiency step by step. According to the German Wind Energy Association, the generator size, the rotor diameter, the hub height, as well as the annual production potential of wind turbines were subject to major technological advancements and thereby increased profitability notably. The technological improvements on a 30-years scale are depicted in Figure 5.1.2.

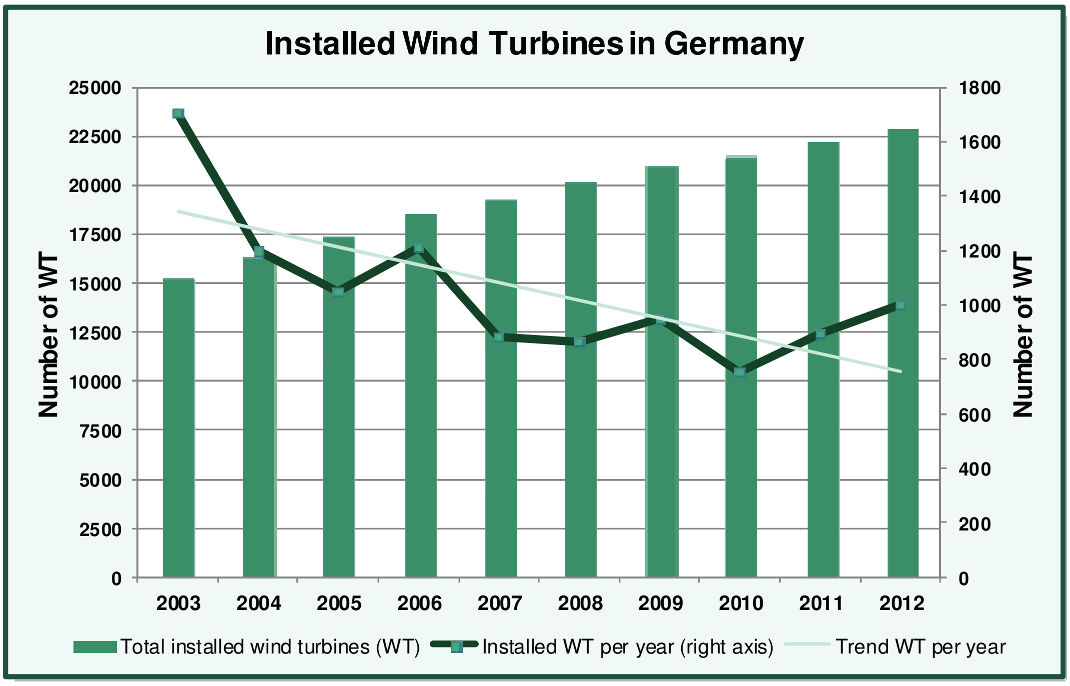
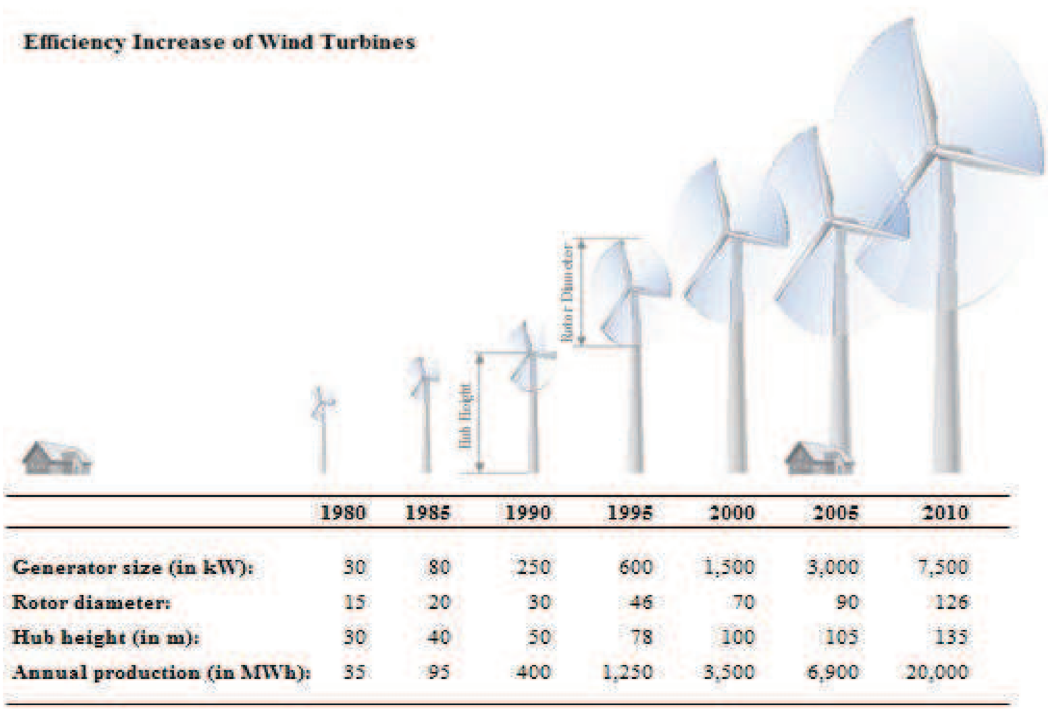


Figure 5.1.1: Installed Wind Turbines in Germany (DEWI, 2012) & (DWGG, 2013)



	1980	1985	1990	1995	2000	2005	2010
Generator size (in kW):	30	80	250	600	1,500	3,000	7,500
Rotor diameter:	15	20	30	46	70	90	126
Hub height (in m):	30	40	50	78	100	105	135
Annual production (in MWh):	35	95	400	1,250	3,500	6,900	20,000

Figure 5.1.2: Efficiency Increase of Wind Turbines (BWE, 2012)

Accordingly, first generation generators accounted for only 30 kW in 1980, before the size increased to 600 kW 15 years later and, for the present, has reached 7,500 kW in the year 2010. As the length of the rotor diameter and the hub height have significant impact on the annual production potential of a wind turbine, which is especially crucial for weak-wind regions, the rotor diameter has been extended from 15 metres in 1980 to 46 metres in 1995 and has reached 126 metres in the year 2010. Simultaneously, the hub height of wind turbines has been extended from 30 metres in 1980 to 78 metres in 1995 and 135 metres in 2010. The annual production in MWh has also experienced an enormous efficiency increase. While the annual production accounted for only 35 MWh in 1980, 15 years later it already accounted for 1,250 MWh and has reached 20,000 MWh in the year 2010. As a rule of thumb, an additional meter in hub height results in a one % increase of output and a doubling of the rotor diameter size results in a quadrupling of output (AEE, 2010).

The advantages of the efficiency increase of wind turbines may be summarised as follows. Firstly, the technological advancements, both for the generator size, rotor diameter, hub height and the annual production, provided the possibility to deploy wind turbines in the inner land rather than only focussing on the scarce wind-rich coastal areas. Secondly, the increased annual production per wind turbine resulted in a higher power output by use of less wind turbines. By comparing the number of total installed wind turbines with the installed rated power in MW, the efficiency increase becomes obvious. As can be seen in Figure 5.1.3, the total installed rated power has risen from 14,609 MW to 31,308 MW in the years 2003 to 2012, resulting in a 114.31 % increase of the installed rated power during that period. However, the total amount of installed wind turbines has not increased at the same rate. In the same period the total installed wind turbines has increased from 15,387 to 23,030, resulting in a percentage increase of 49.67 %. By analysing both growth rates, it can be concluded that the installed rated power has increased by an approximate factor of 2 compared to the numerical increase in wind turbines (114.31 % ÷ 49.67 %).

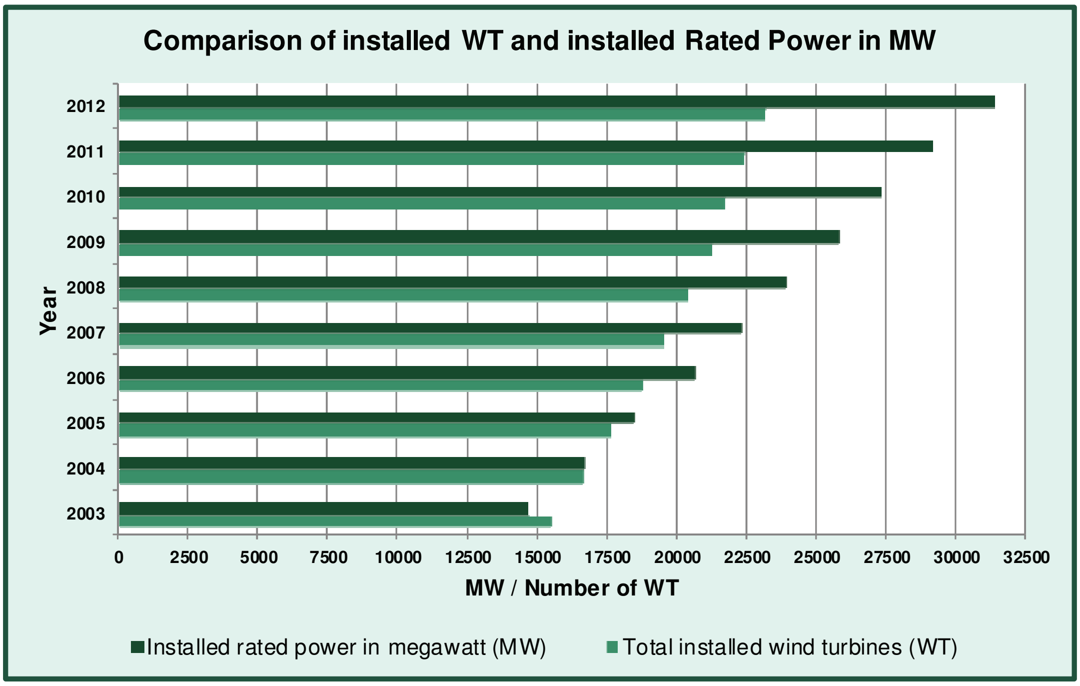


Figure 5.1.3: Comparison of installed WT and installed Rated Power in MW (DEWI, 2012) & (DWGG, 2013)

5.2. Future wind energy potential

The future wind energy potential in Germany is driven by two different types of projects in the onshore sector. In order to achieve the targets of the Energiewende with respect to the wind energy sector, additional Greenfield and repowering projects have to be realised. Except for the offshore sector, with a specified target of 10 GW installed capacity by 2020, the German government has not yet set specific targets for other forms of renewable energies in the electricity sector by 2020 (Deutscher Bundestag, 2011). According to the German Renewable Energy Federation, a total installed capacity of 45 GW for the onshore sector could be reached by 2020 (BEE, 2009).

5.2.1. Greenfield projects

One of the most constraining factors for the further development of onshore wind farms is the limited amount of appropriate and designated project sites. Project sites are distinguished by three different categories: coast, North German lowlands and uplands. The coastal regions are defined as a five kilometre broad strip along the North German coastal line. While the majority of newly installed wind turbines were deployed in the coastal areas and in the North German lowlands in the beginning of the wind energy era in the early 1990's, more and more turbines are installed in the uplands (750 MW in 2011). By comparison with 816 MW in the North German lowlands and only 330 MW in the coastal areas in 2011, the increasing importance of inner land project sites becomes obvious. In total, 17 % of the installed rated power of wind energy in Germany is deployed in the coastal regions, 55 % in the North German lowlands and 28 % in the uplands (Fraunhofer IWES, 2012).

According to a special report by Dr.-Ing. Stefan Bofinger from the Fraunhofer Institute on the onshore wind potential and wind areas (Bofinger, 2012), utilisable areas can be categorised into four classes. Areas such as national parks, constructed areas or bodies of water account for 77.6 % of the total area in Germany and are defined as being unusable for wind energy. The remaining 22 % are potentially utilisable, but subdivided into three categories: areas without restrictions (7.9 %), usable forest outside nature reserves (4.4 %) and usable nature reserves (10.1 %).

A scenario, in which a realistic fraction of only two % of the utilisable areas without restrictions in Germany was assumed for wind energy, depicted a theoretical maximum of 198 GW installed rated power and a respective yearly production of approximately 390 TWh. This would equal about 65 % of the German gross electricity consumption of 603 TWh in 2010 (Bofinger, 2012).

Since Germany is a federal state, the implementation of the 2 % scenario including the designation of appropriate wind areas would be carried out by every single German state. It was found that Bavaria has the greatest potential in terms of unutilised wind areas (about 41 GW could potentially be installed), followed by Lower Saxony (26 GW) and Baden-Wuerttemberg (23 GW) (Gille, 2011).

5.2.2. Repowering projects

As already elaborated in previous chapters of this study, the wind energy sector in Germany has grown steadily as from the early 1990's. A lot of appropriate wind areas have already been utilised which leads to more and more difficulties in finding sites for Greenfield projects. In chapter 5.1 it was pointed out that more than 23,000 wind turbines have been installed up to the end of 2012. According to the current status of the EEG (amendment 2012), which will later be discussed in more detail, all wind turbines which have been installed before the first of January 2002 are allowed to be repowered. According to the chairman of the German Wind

Energy Association, Hermann Albers, in mid-2012 about 13,750 wind turbines accounting for a rated power of 12,000 MW fall within this regulation and could potentially be repowered (Itasse, 2012).

However, the decision whether an older wind turbine is going to be replaced by a modern installation is economically driven and has to be taken on a case by case basis. Various aspects have to be accounted for before a final decision on a repowering project can be made. To exemplify, two case studies will be analysed later in the thesis. Both example cases will make clear that repowering decisions have to be taken very cautiously and have to be justified against investors. Consequently, not all of the above-mentioned 13,750 wind turbines will be repowered in the near future and a considerable fraction is likely to be operated to the end of the particular project lifetime.

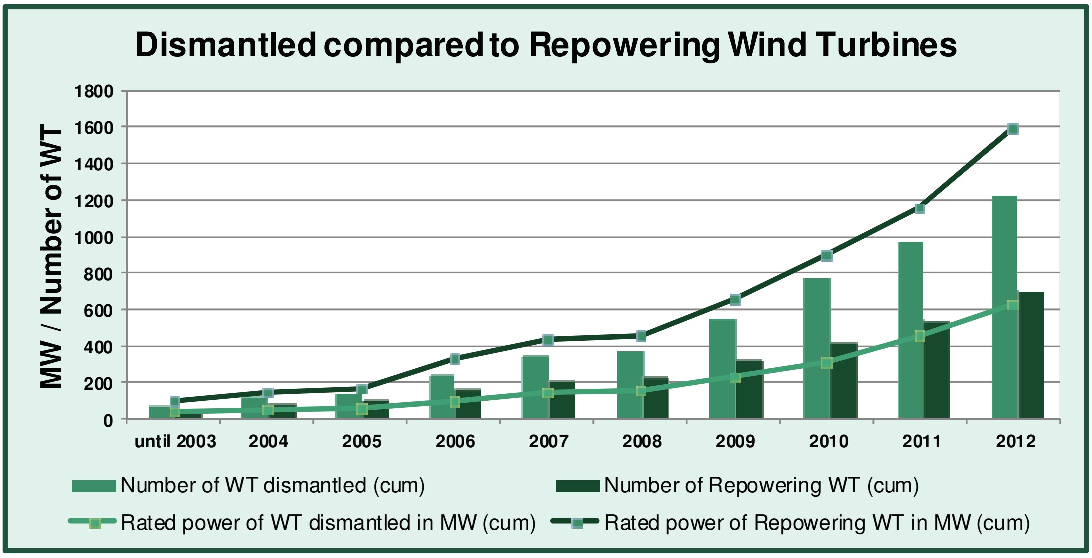


Figure 5.2.2.1: Dismantled WT compared to Repowering WT (DEWI, 2012) & (DWGG, 2013)

Figure 5.2.2.1 shows a comparison of the number of wind turbines which were dismantled (bright green bar) and which were installed as a replacement (dark green bar) in Germany. The time scale comprises the period from the year 2003 (including the period prior to 2003) until the end of the year 2012. The numbers are cumulative over time. In addition, the respective rated power which was dismantled (bright green curve) and which was newly installed through the repowering wind turbines (dark green curve) is also illustrated in the chart.

It shows that 83 wind turbines with a rated power of only 35 MW (bright green curve) have been dismantled until 2003. From this time on more and more wind turbines have been dismantled. Until the year 2009 for instance, the number of wind turbines have already accumulated to 557, however only accounting for a rated power of 232 MW. At the end of 2012 the number of dismantled wind turbines has increased to 1,231 accounting for a rated power of 629 MW. By analysing this development it becomes evident that the rated power of the dismantled wind turbines (bright green curve) was lower than the number of dismantled wind turbines. Consequently, the average rated power of a single wind turbine was below 1 MW, which is relatively low compared to state-of-the-art technology. At the end of 2012 the average rated power per dismantled wind turbine has reached a value of approximately 0.51 MW.

On the contrary, the development of the repowering wind turbines as a replacement for the dismantled ones shows a different trend (dark green bar). The number of newly deployed installations until the end of 2012 has been considerably lower than the number of dismantled turbines. Until 2003 the dismantled wind turbines have amounted to 83 and have been replaced by only 54 new, more efficient installations. As a result, the installed rated power has increased from 35 MW to 93 MW, although the number of wind turbines has been reduced significantly. Similarly, 557 wind turbines which have been dismantled until 2009 have been replaced by only 329 new installations. This has led to a rise of the installed rated power from 232 MW to 653 MW. At the end of 2012 the newly installed turbines have accumulated to 702, while 1,231 installations have been dismantled. Nonetheless, the installed rated power has increased from 629 MW to remarkable 1,595 MW. By comparing the trend of the newly installed wind turbines (dark green bar) with the newly installed rated power (dark green curve), it can be observed that the average rated power per wind turbine has increased significantly throughout the depicted time period and has reached a value of approximately 2.27 MW per wind turbine at the end of 2012.

The above analysis has proven the great repowering potential of aging wind turbines. Through the technological advancement in the last decades an enormous improvement regarding the average rated power per wind turbine can be observed leading to a higher efficiency and a boost in annual electricity production per wind turbine.

Another conclusion that can be drawn from Figure 5.2.2.1 is that a relatively small amount of wind turbines (1,231) have been dismantled up to now. As the total number of installed wind turbines in Germany has reached about 23,000 at the end of 2012 and will further rise in the future, the repowering potential will also increase. More and more wind turbines will come within the repowering regulation defined by the EEG (amendment 2012) in the near future and add up to the number of wind turbines which were already allowed to be repowered in mid-2012 (13,750).

5.3. The wind condition in Germany

The feasibility of a wind farm project strongly depends on the wind condition at the project site. It should be noted that the production of a wind turbine increases disproportionately to the wind speed (Windwärts, 2013). Several factors influence the power available (P) in a wind stream: the air density (ρ), the area of the wind rotor (A), and the wind velocity (v). The power equation is defined as (Mathew, 2006):

$$\boldsymbol{P = \frac{1}{2} \cdot p \cdot A \cdot v^3} \qquad (5.1)$$

From this equation the vital importance of the wind velocity can be seen since it has a cubic relationship with the power. Therefore, a doubling of the wind speed results in an eightfold increase of the power output. However, the natural wind power is not the only factor necessary for the electricity production. The wind turbine has to convert the wind power in a wind stream into electricity, but cannot completely extract the available power from the wind. Albert Betz, a German physicist, developed the power coefficient (Cp) defined as (Mathew, 2006):

$$\boldsymbol{C_p = \frac{Power\ extracted\ by\ the\ wind\ turbine}{Total\ power\ available\ in\ the\ wind}} \qquad (5.2)$$

Further, Albert Betz research results showed that the maximum power coefficient is equal to 59 %, the so called Betz limit. This means that a conventional wind turbine can convert 59 % of the kinetic energy from the wind into mechanical energy (Windpower, 1999). Thus, the power equation is adjusted (Waller, 2009):

$$\boldsymbol{P = C_p \cdot \frac{1}{2} \cdot p \cdot A \cdot v^3} \qquad (5.3)$$

A closer look at different types of wind turbines shows that they have different power performance curves at different wind speeds. In general, the power curve follows a relationship between the wind speed at which the wind turbine starts to operate (cut-in wind speed) and the rated power of the wind turbine (Ackermann, 2005). Depending on the type of the turbine, electricity generation starts at a cut-in speed of approximately 3 to 4 m/s (AEE, 2013). The rated power is reached at wind speeds between 12 and 16 m/s, which is known as the rated wind speed (Ackermann, 2005). Whenever the wind speed exceeds the rated wind speed of the respective wind turbine, the maximum power production will be limited within a certain wind interval. When the upper limit of the interval, known as the cut-out speed, is reached, the production is stopped immediately. In general, the cut-out speed is reached at approximately 25 m/s (Waller, 2009).

The analysis of the wind to power relationship clarifies the importance of the wind speed for the productivity of a wind turbine. Therefore, wind farms are built in regions where the wind conditions favour high electricity yields. Different factors have to be taken into account when analysing the wind potential. Firstly, the wind speed is strongly influenced by the surface roughness. Depending on the type of surface roughness and the building structure, different wind speed profiles can be observed. While the wind is no longer influenced by the surface at higher altitudes at approximately five kilometres, surface roughness and obstacles on the ground strongly influence the wind by decelerating it. Between these extremes the wind speed increases with height. Different roughness classes for every land cover type have been developed. The correlating roughness lengths for every land cover type are then used to calculate the so called vertical wind shear (Wind-data, 2013). The logarithmic wind profile is defined as (Waller, 2009):

$$\boldsymbol{v_2 = v_1 \cdot \frac{\ln\left(\frac{h_2}{z_0}\right)}{\ln\left(\frac{h_1}{z_0}\right)}} \tag{5.4}$$

According to the above mentioned roughness classes, a field landscape near the German coast would have a roughness length (z_0) of 0.03 metres. By assuming a wind speed (v_1) of 6.5 m/s at the initial height (h_1) of 10 metres, the wind speed (v_2) at 120 metres height (h_2) can be calculated as follows (Waller, 2009):

$$v_2 = 6.5\ [^{m}/_{s}] \cdot \frac{\ln\left(\frac{120\ m}{0.03\ m}\right)}{\ln\left(\frac{10\ m}{0.03\ m}\right)} = 9.3\ [^{m}/_{s}]$$

Secondly, wind conditions can differ significantly depending on the geographical area. In Germany, the average wind speeds at 10 metres above ground level show a clear north-south divide. In Figure 5.3.1, the red shaded areas represent an average wind speed of more than 5 m/s, while the blue shaded areas represent an average wind speed of 4 to 5 m/s. The map clearly depicts that besides the coastal areas only a few areas provide sufficient average wind speeds for the wind industry. However, modern onshore wind turbines operate at hub heights up to 150 metres and not at 10 metres above ground. Therefore, the illustration only serves as a rough overview and is not representative for all appropriate project sites in Germany.

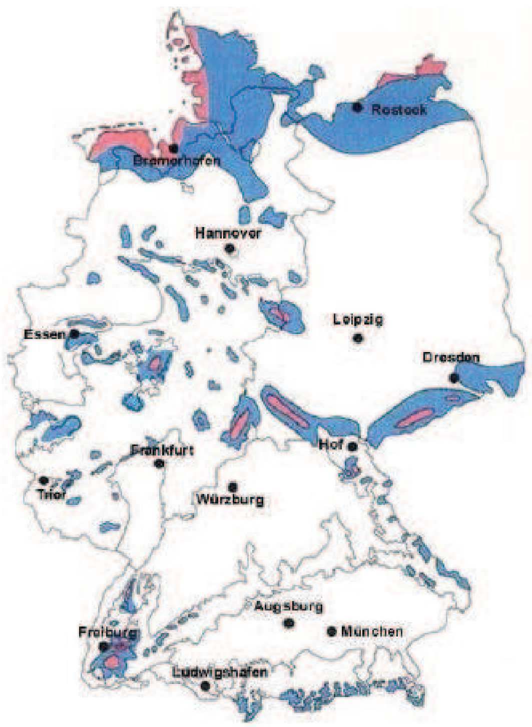


Figure 5.3.1: Average Wind Speeds at 10 Metres above Ground Level (Waller, 2009)

Another indicator for the wind condition in Germany is the orographical structure of the country. Since the flow behaviour of the wind follows the earth surface, the wind is lifted by obstacles such as hills, mountains, forests or buildings. As can be seen from Figure 5.3.2, the wind conditions directly behind these obstacles are unfavourable for wind farms. Due to the uplifting of the wind streams, turbulences and weak wind areas are created (BINE, 2007). A closer look at the specific wind streams reveals that higher wind speeds are reached faster at similar heights near the coast and the North German lowland compared to the Central German Upland and the German part of the Alps.

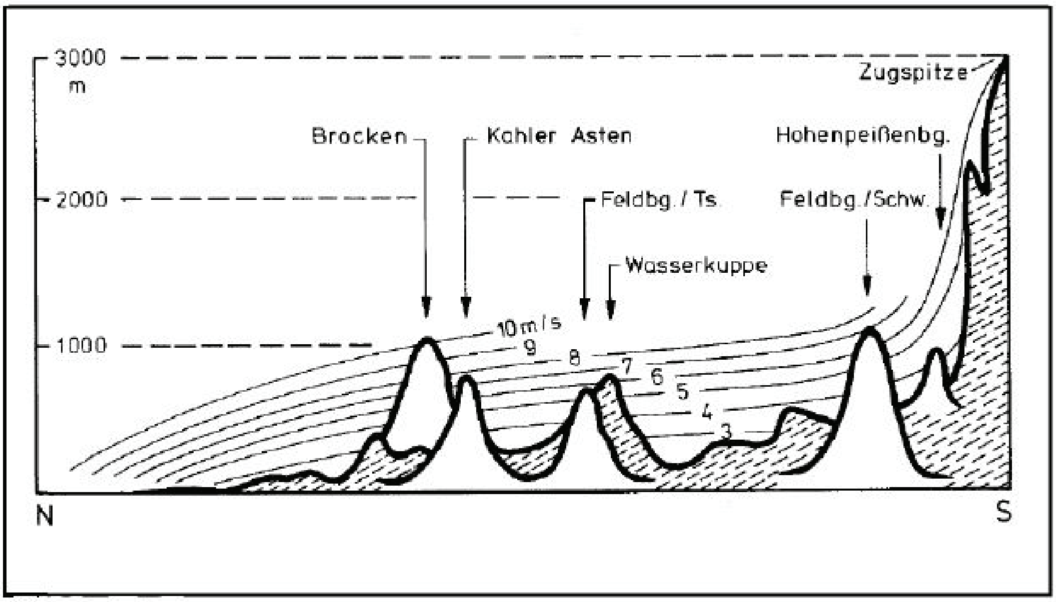


Figure 5.3.2: Orographical Structure of Germany (FIZ, 2007)

According to the German Meteorological Service (DWD), the annual average wind speed at 80 meters above ground level shows significant differences throughout Germany. The reference period used comprises the years 1981 to 2000. Figure 5.3.3 shows a wind map of Germany in which a grid of one kilometre was applied. In the legend at the bottom right corner of the map a colour range is depicted. It starts with dark green to bright green, yellow, bright to dark orange, red, dark red and ends with bright brown to dark brown. The darker the area is coloured on the map (red and brown), the higher the wind speed at the particular geographical area. From the colour distribution on the map, it can be inferred that the coastal areas in north-western Germany provide the best wind conditions ranging from a yearly mean wind speed of approximately 7 to more than 7.9 m/s. In the North German lowlands the wind speeds are considerably lower ranging from 4.9 to 7 m/s. In the German uplands wind speeds comparable to the coastal areas can be found. The lowest wind speeds can be observed in the eastern and southern part of Germany. In the regions around Leipzig, Magdeburg, Nurnberg, Munich, Karlsruhe and Stuttgart for instance, wind speeds only range between less than 4.0 and 5.2 m/s.

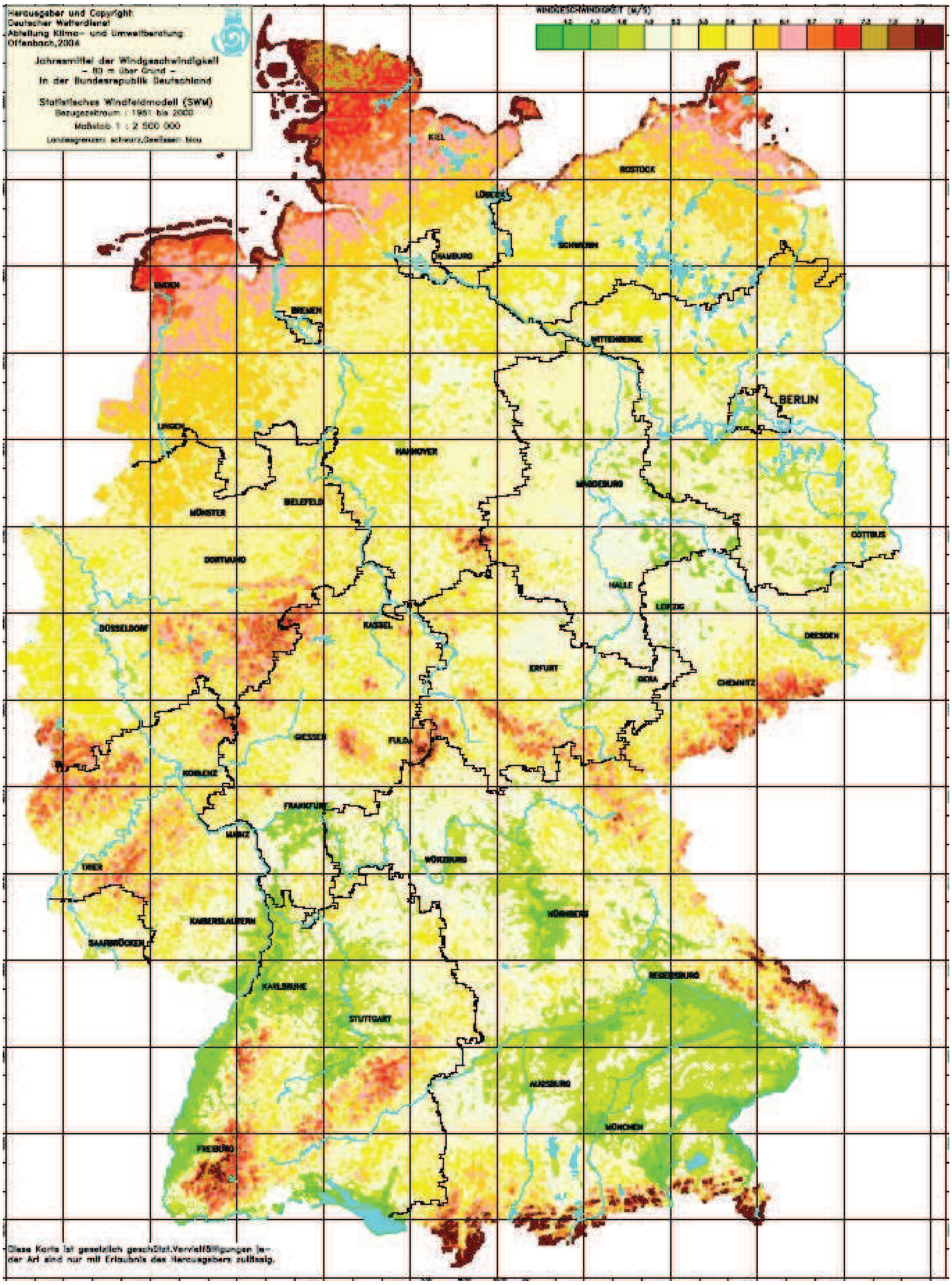


Figure 5.3.3: Average Wind Speeds at 80 Metres above Ground Level (DWD, 2004)

Although the annual average wind speeds serve as a point of reference where appropriate project sites are located, project developers use additional sources to evaluate the wind potential. Since the electricity production of a turbine is disproportionate to the wind speed, the annual average wind speed at a specific area is not accurate enough to rate the annual performance of an individual wind turbine (Windwärts, 2013). A simple example can be used to illustrate this phenomenon. An annual average wind speed of 5 m/s could either mean that the wind blows constantly throughout the whole year or that a wind speed of 10 m/s and calmer period occurs for half a year, respectively. In the latter case the energy production would be quadrupled, although the annual average wind speed is identical.

Hence, a production index (known as IWET-index or BDB-index, also Keiler-Häuser-index) is used to evaluate the long-term wind potential of a specific area. The data can either be used by project developers to forecast the expected energy production of new wind energy projects or by existing operators to compare the actual production with the index values. In comparison to ordinary windiness measurement indices, such as provided by DWD (as seen in Figure 5.3.3), a production index uses energy production data provided by thousands of wind turbines in operation. The monthly energy production however, can deviate significantly from the long-term mean due to variability of the windiness. In order to obtain a stable mean of the energy production from the monthly production, wind farm operators would have to wait several months before an accurate evaluation could be made. To avoid that, production indices such as the BDB-index serve as a tool to correct the fluctuating monthly energy production (BDB, 2013a).

In order to improve the accuracy of the calculations, the BDB-index divides Germany into 25 wind regions distinguished by the landscape structure, meteorological experiences and the amount of registered wind turbines. These regions are illustrated in Figure 5.3.4 below. The available turbine production data goes back to the end of the 1980’s and is managed by the company Ingenieur-Werkstatt Energietechnik, commonly known as IWET (Windwärts, 2013). In the original version of the BDB-index from 2011, the respective 100 % level of long-term energy production of reporting wind turbines is based on a 14-year period from 1996 to 2009 (BDB, 2013a).

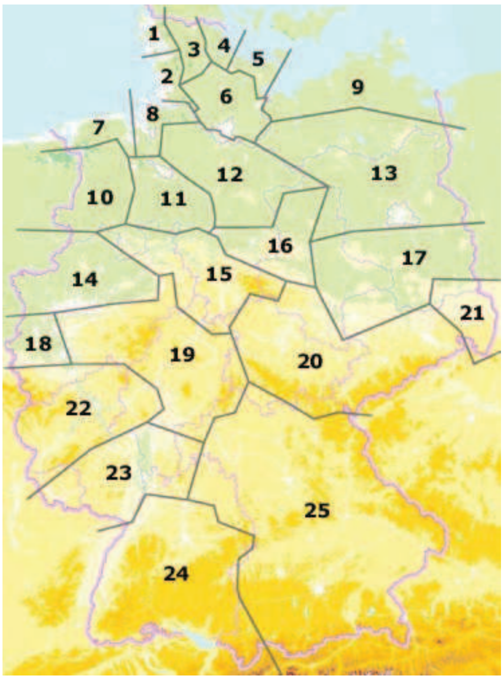


Figure 5.3.4: Wind Regions in Germany (BDB, 2013b)

The BDB-index as such is a statistical, monthly mean which describes the relation between the monthly energy production of wind turbines in a specific region (in kWh) and the long-term mean energy production of the reporting wind turbines in this region. A minimum dataset of ten wind turbines per region and month is required in order to be indexed (BDB, 2013a). With the resulting percentage value (the BDB-index is valid for a particular region and month) it can be determined to what extent the monthly energy production of the respective wind turbine(s) deviates from the probable long-term mean energy production of the reporting wind turbines (BDB, 2013a). In other words, the index gives information on how strong or how weak the wind was in a particular region and month.

In addition to this, the BDB-index is then used to correct the actual monthly energy production to derive a stabilised value regarding the probable mean annual energy production in the long term. In so doing, the influence of monthly wind variability can be reduced (BDB, 2013a) and a projection of the long-term energy production can be made more accurately (Windwärts, 2013).

The following simplified calculation method clarifies how the corrected monthly energy production is obtained (BDB, 2013a):

$$\frac{\boldsymbol{Monthly\ yield}}{\boldsymbol{BDB-index}} \cdot \mathbf{100} = \boldsymbol{corrected\ monthly\ yield} \qquad (5.5)$$

Example case:

Monthly energy production in March = 140,000 kWh, BDB- index = 95 %

Monthly energy production in April = 80,000 kWh, BDB-index = 55 %

Applying the above mentioned formula yields the following results:

Corrected energy production for March: $\left(\frac{140{,}000\ kWh}{95}\right) \cdot 100 = 147{,}368\ kWh$

Corrected energy production for April: $\left(\frac{80{,}000\ kWh}{55}\right) \cdot 100 = 145{,}455\ kWh$

Now the probable long-term mean annual energy production can be derived:

$$\left[\frac{(147{,}368\ kWh + 145{,}455\ kWh)}{2\ months}\right] \cdot 12\ months = 1{,}756{,}938\ kWh$$

Although the BDB-index is commonly used in the German wind industry, various drawbacks of the calculation method have been identified. In an analysis of the long-term wind speed trends in Germany by GL Garrad Hassan Deutschland GmbH, the setting of the BDB 100 % level is subject to ongoing concern (Winkler, 2011). As shown in the calculations above, the setting of the 100 % level has a direct impact on the projection of the energy production and therefore on the financing of the whole wind energy project. The question arises which reference period is suitable for the production index.

Since 1994 the reference periods have been adjusted several times. According to anemos-jacob GmbH, an independent consultancy for wind energy, a downside of the former BDB-index from 2003, based on the period from 1989 to 2002, is that it relies on inaccurate and incomplete data. In several regions incomplete or even no production data of wind turbines was available in the early stage of the wind energy business. However, the missing data was extrapolated manually in order to set up the BDB-index. Furthermore, the composition of the reporting wind turbines is constantly changing through new installations and the corresponding data reporting of the operators. Modern wind turbines have different characteristics than older types (such as technical availability or park efficiency), leading to difficulties in assessing the energy production of modern wind turbines in order to construct the index correctly (Wind-Lexikon, 2013). In the version of 2006, a reference period from 1975 to 2004 was used to determine the 100 % level. Remarkably enough, the

100 % level was only reached once (in 2007) in a ten-year period from 2000 to 2010. This casted doubts whether the wind potential had dramatically dropped or whether the BDB-index had been based on wrong assumptions (AAE, 2012).

Even the operators of the BDB-index admit that the windiness in the currently chosen base period (1996 - 2009) could potentially be above average (BDB, 2013a). Consequently, business plans should not be solely based on the BDB-index since the projected energy production is likely to be higher than the actual energy production.

6. The Evolution and Adaptation of the Legal Framework (EEG)

The implementation of the German Renewable Energy Act (Erneuerbare-Energien-Gesetz, EEG) was the cornerstone for the successful development of the renewable energy sector in Germany. Nevertheless, major milestones had already been achieved before the actual implementation in the year 2000. Figure 6.1 summarises the historical development of the legal framework. It focuses on the most important regulations relating to the wind energy sector. The feed-in law, which is seen as the forerunner of the EEG, was implemented in 1991. Several important regulations such as the purchase obligation for renewable energy, the priority connection to the

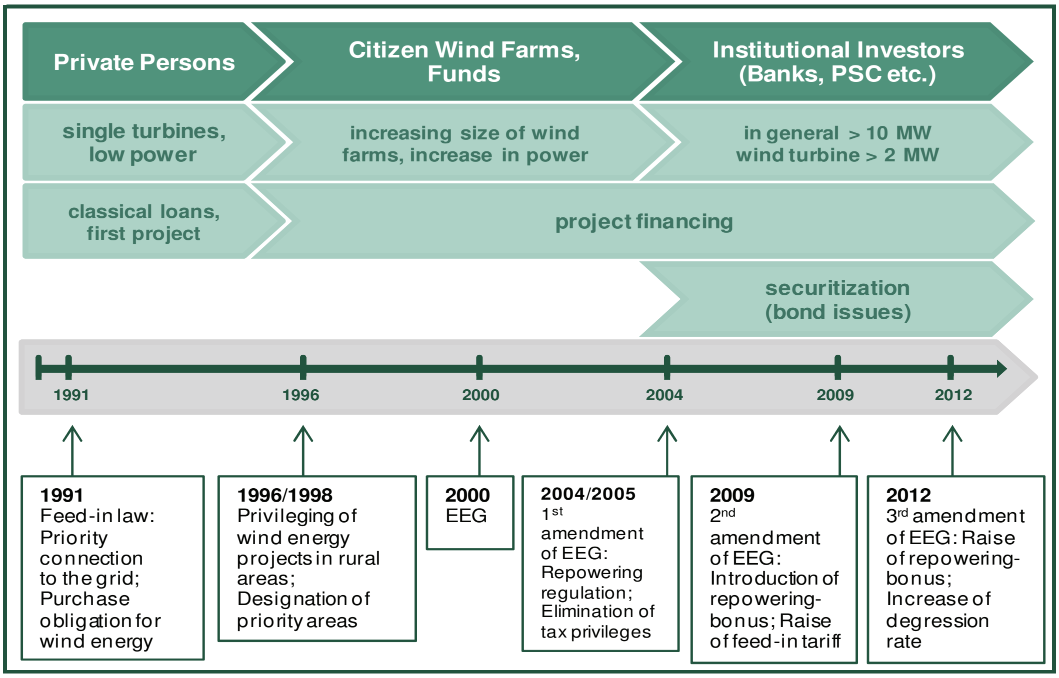


Figure 6.1: Historical Development of the Legal Framework (KMPG, 2009)

grid as well as the market price-oriented feed-in tariff for electricity from renewable energies, provided the legal basis for this sector and stimulated investments. In the years 1996 and 1998 further milestones for the wind industry were achieved. In order to stimulate the expansion of wind energy, projects in rural areas were classified as being privileged. Additionally, priority areas for potential projects were designated. With the entry into force of the EEG in the year 2000, fixed feed-in tariffs for electricity produced from wind energy were granted for the first time. The guaranteed feed-in tariff was linked to an investment period of twenty years, resulting in a further increase of investment security. In connection with special tax incentives, the company form GmbH & Co. KG[1] evolved as being the dominant legal form for wind farm projects. Four years after the entry into force the EEG was amended for the first time. One of the most important newly introduced clauses for the wind energy was a specific repowering regulation. Yet, this regulation did not release the expected impulse for repowering projects. Besides that, the elimination of tax privileges for wind energy in 2005 led to a new investment structure in the wind energy business since wind energy funds lost their attractiveness. From then on long-term institutional investors such as banks and power supply companies (PSC) played a more important role, benefitting from the high planning security in terms of guaranteed feed-in tariffs for a period of twenty years. With the second amendment in the year 2009 a further boost for the wind industry was created. The feed-in tariffs were raised, the annual degression rates for the tariffs were reduced (to 1 %) and more attractive repowering conditions were introduced. For the first time in the history of the EEG a repowering-bonus (0.49 €Cent/kWh) and a SDL-bonus[2] (0.50 €Cent/kWh, paid until 31. December 2013) were granted and served as an incentive for the repowering of old wind turbines (KPMG, 2009). For the time being, the last amendment of the EEG was put into force in 2012. The most essential differences in comparison with the 2009 version are the raise of the annual degression rate (to 1.5 %), the reduction of the SDL-bonus (to 0.48 €Cent/kWh, paid until 1 January 2015) as well as the increase of the repowering-bonus (to 0.50 €Cent/kWh) (BWE, 2011).

[1] The GmbH & Co. KG (limited commercial partnership with a limited liability company as a partner) is a sub-form of the KG (limited commercial partnership). While the KG's purpose is aimed at the operation of a commercial trade under a joined corporate name, in which at least one of the partners is liable without limitations, the GmbH & Co. KG provides for the possibility of excluding the full personal liability of all the natural entities involved in a partnership while being treated as taxed as a partnership (IHK, 2013).

[2] The SDL-bonus (system services bonus) is granted if wind turbines and wind farms fulfil certain requirements of the electric grid (BWE, 2013). For more information please refer to regulation SDLWindV.

6.1. Feed-in tariff according to EEG amendment 2012

In Figure 6.1.1 an overview of the EEG tariffs according to the actual amendment of the year 2012 is given. Depending on the year of start-up of the wind energy installation, different tariff rates are granted. It should be noted that a degression rate of 1.5 % is included in the tariff rates which explains the annual reduction.

EEG 2012: Tariffs for Onshore Wind Energy

Degression rate: 1.5 %; remuneration period 20 years

Year of Start-up	Basic Tariff (in ct/kWh)	Initial Tariff (in ct/kWh)	SDL-Bonus (in ct/kWh)	Repowering-Bonus (in ct/kWh)
2012	4,87	8,93	0,48	0,50
2013	4,80	8,80	0,47	0,49
2014	4,72	8,66	0,47	0,49
2015	4,65	8,53	0,46	0,48
2016	4,58	8,41	-	0,47
2017	4,52	8,28	-	0,46
2018	4,45	8,16	-	0,46
2019	4,38	8,03	-	0,45
2020	4,32	7,91	-	0,44
2021	4,25	7,79	-	0,44

Figure 6.1.1: EEG 2012 Tariffs for Onshore Wind Energy (BMU, 2011b)

In this sense it is very important to understand that the basic tariff in the respective year (4.87 €Cent in 2012, 4.80 €Cent in 2013 and so forth) is guaranteed for every wind farm without any restrictions. On the contrary, the higher initial tariff (8.93 €Cent in 2012, 8.80 €Cent in 2013 and so forth) is granted only for a period of five years from the date of start-up (EEG, 2012). If the wind energy installation produces 150 % of the reference yield[3] or more within a period of five years from the date of start-up, the basic tariff will be paid after five years until the end of the twenty-year remuneration period. Otherwise, the higher initial tariff is extended by two months for each 0.75 % of the reference yield by which the installation yield falls short of 150 % of the reference yield (BMU, 2011c). The reasoning behind the differentiation in terms of the duration of payment of the initial tariff is that weak-wind locations shall benefit from higher tariffs over a longer period in order to be competitive compared with strong-wind locations.

[3] "The reference yield shall be the quantity of electricity which each specific type of wind-powered installation, including its hub height, would, if calculated on the basis of measured P-V curves, yield during five years of operation if it were built at the reference site" (EEG, 2012). For more information please refer to Renewable Energy Sources Act, Annex 3.

The following example clarifies the calculation method (BMU, 2011c):

A wind energy installation produces 95 % of the reference yield within the first five years from the date of start-up in 2013 and meets the requirements to receive the SDL-bonus. As can be seen in Figure 6.1.1, the basic tariff in 2013 amounts to 4.80 ct/kWh, the higher initial tariff to 8.80 ct/kWh, and the SDL-bonus to 0.47 ct/kWh. Knowing that, the duration of payment of the higher initial tariff as well as the average tariff over the remuneration period of twenty years can be calculated.

Example case:

1) $150\ \%\ of\ the\ reference\ yield\ -\ 95\ \%\ installation\ yield\ =\ 55\ \%\ difference$

2) $(\frac{55\ \%}{0.75\ \%})\cdot 2\ months\ =\ 146.67\ months\ =\ 12\ years\ and\ 3\ months$

3) $\boldsymbol{Duration\ of\ payment\ of\ the\ higher\ initial\ tariff}\ =$

$12\ years\ and\ 3\ months\ +\ 5\ years'\ initial\ tariff\ =\ \boldsymbol{17\ years\ and\ 3\ months}$

4) $\boldsymbol{Average\ tariff}\ =\ (\frac{17.25\ years}{20\ years}\cdot 8.80\ ct/kWh)\ +\ (\frac{17.25\ years}{20\ years}\cdot 0.47\ ct/kWh)\ +$

$(\frac{2.75\ years}{20\ years}\cdot 4.80\ ct/kWh)\ =\ \boldsymbol{8.66\ ct/kWh}$

The above calculation shows that the difference between the reference yield and the installation yield is the decisive factor in determining the duration of payment of the higher initial tariff. This indicates that weak-wind locations will be granted a longer payment period compared to strong-wind locations. The maximum of 20 years is granted to locations at which the installation yield produces 82.5 % or less of the reference yield (WIB, 2013).

6.2. Repowering incentives according to EEG amendment 2012

The requirements for the repowering of wind turbines are laid down in section thirty of the actual EEG amendment (§ 30 Wind energy - repowering). Section 30 (1) specifies the requirements which have to be fulfilled in order to be entitled to receive the repowering bonus amounting to 0.5 ct/kWh in addition to the initial tariff (valid for the year 2012). In order to benefit from the repowering incentive, the respective wind-powered installation has to be a "permanent replacement for one or more existing installations within the same or an adjoining district" (EEG, 2012) where the installations to be replaced "were commissioned prior to 1 January 2002" (EEG, 2012) and were entitled to tariff payments "pursuant to the tariff provisions of the Renewable Energy Sources Act in the version applicable to the respective installation" (EEG, 2012). With respect to the repowering installations section 30 (1) further specifies that "the installed capacity of the repowering installations amounts to at least two times that of the installations they replace" (EEG, 2012) and that the number of repowering installations may "not exceed the number of installations they replace" (EEG, 2012).

6.3. Current political disputes over further EEG amendments

In the previous chapters the tariff-based framework of the EEG was discussed in detail. It was highlighted that operators of renewable energy sources receive a fixed feed-in tariff. Consequently, the question arises who bears the financial burden of subsidising the renewable energy sector. The subsidy mechanism is financed by electricity end consumers[4] in the form of the Renewable Energies Act surcharge (EEG surcharge), which is the difference between the legally fixed feed-in tariff and the respective spot price of electricity. Paradoxically, the extensive increase of electricity from renewable energy sources in the German grid reduced the spot price of electricity, leading to a larger EEG surcharge and therefore to higher costs for the final consumers. This development could potentially lead to less acceptance of the intended energy turnaround in Germany. Since the share of renewable energy sources in the electricity production will increase further, the electricity costs for final consumers are expected to increase in the future, unless the current regulatory framework will be amended.

With the advent of the public dissatisfaction, the Federal Minister of Economy, Philipp Rösler, and the Federal Minister of the Environment, Peter Altmaier, presented a common position in mid of February 2013 how the EEG surcharge could be limited in order to reduce the electricity costs for the final consumers (EUWID, 2013). Subsequently, only the most important alterations, which would have a direct effect on the wind energy industry, are summarised. Firstly, the remuneration for new installations in the first five months from the date of start-up would be equivalent to the spot price of electricity only. As from 17 May 2013 it

[4] According to section 40 of the EEG amendment 2012, the EEG surcharge shall be limited for "electricity-intensive manufacturing enterprises with high electricity consumption or rail operators" in order to "reduce the electricity costs for these enterprises and thereby maintain their international and intermodal competitiveness" (EEG, 2012)

accounts for 2.36 ct/kWh (EEX, 2013). This measure would be valid for all new installations as from 1 August 2013. Secondly, the initial tariff would be reduced to 8 ct/kWh. In the same manner, the SDL-bonus and the repowering-bonus would be cancelled completely. Additionally, the reference yield model as presented in section 6.1 of this report would be adapted. Thirdly, existing installations which were put into service prior to 1 August 2013 would be directly affected by the intended measures as well. In the year 2014 the feed-in tariffs for all existing installations would be reduced by one and a half percent for a limited period of one year.

In total, Philipp Rösler and Peter Altmaier expect a reduction of electricity costs in the amount of € 1,160,000,000.00 referring to the year 2014, if all measures which are laid down in their common position would enter into force. Due to the cutting measures, the EEG surcharge for 2014 could be legally limited to 5.277 ct/kWh which corresponds to the amount of 2013. From 2014 onwards the EEG surcharge would increase by 2.5 % annually (EUWID, 2013).

The aforementioned potential EEG amendments would have a direct negative impact on the feasibility of future wind energy projects. These will be discussed later in the study.

7. The Project Developer Windpark nördliches Emsland (WnE)

Before the case studies are presented, the project developer WnE GmbH will shortly be introduced.

7.1. Brief history and current status of realised projects

The WnE GmbH, located in Aschendorf, Germany, was founded by the managing directors Georg Kruse and Wilhelm Jansen in the legal form of a limited liability company (GmbH[5]) in the year 1997. Its competence lies in the area of the development and the conception of funds for wind farm projects. Further, WnE is responsible for the commercial and technical management of the funds. At the end of 2012, WnE has realised 15 wind energy funds with 75 wind turbines, is responsible for approximately 1,250 investors and 300 lessors, manages an investment volume of about € 160 million and generates an annual energy production of about 200 million kWh.

7.2. Description of WnE's business model

As can be seen in Figure 7.2.1 WnE is a 100 % subsidiary (100%ige Tochter) of the Emsländisches Landvolk, Kreisverein Aschendorf-Hümmling, which is a regional farmers' association. Its main function is to plan and develop new wind energy funds (Projektierung) as described in the previous chapter. For every wind energy fund a separate operating company (Betreibergesellschaft) in the legal form of a limited commercial partnership with a limited liability company as a partner (GmbH & Co. KG) is set up. WnE takes over the technical and commercial management of the operating companies (kaufmännische und betriebliche Betriebsführung). The scope of services is defined in special service contracts (Dienstleistungsverträge) between WnE and the operating company. In the processes of setting up and operating the wind energy fund, several stakeholders are directly involved. These include banks (Kreditinstitute, e.g. financing of the project), energy suppliers (Energieversorger, e.g. connection of the wind farm to the grid), insurances (Versicherungen, e.g. insurance contracts for wind turbines), manufacturers (Hersteller, e.g. contracts of sale for wind turbines), auditors (Wirtschaftsprüfer, e.g. prospectus requirements for

[5] The GmbH (limited liability company) "is a trade company with a corporate organisation and its own legal personality. Unlike partnerships, it is not the combination of persons, but the provision of capital amounts which is in the foreground. (...) It has a share capital [at least € 25,000 "note from the author"] determined by the Shareholders' Agreement, which matches the sum total of the share contributions to be made by the shareholders. Only the company is liable to creditors for corporate debts" (IHK, 2013).

wind energy funds), property owners (Grundstückseigentümer, e.g. properties in a designated area for wind energy) and limited partners (Kommanditisten, e.g. regular shareholders' meetings). In order to accelerate the implementation of wind energy projects an investment company, the WnE Invest GmbH, was set up. It is a 100 % subsidiary of WnE GmbH and is responsible for providing investment capital for new wind energy projects (Bereitstellung von Kapital für Neuprojekte) and for buying shares of limited partners on the secondary market (Übernahme von Kommanditanteilen), if necessary. Due to the opportunity of pre-financing a project (carried out by the WnE Invest GmbH), more time is available for the wind energy fund to collect the required investment capital from potential investors (limited partners).

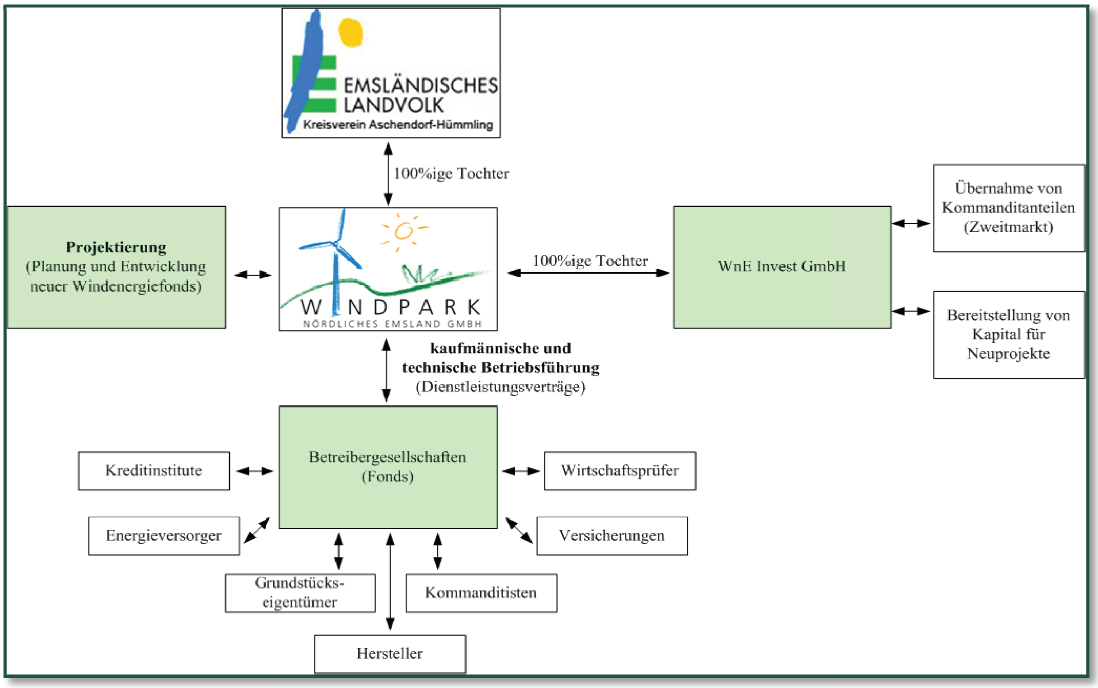


Figure 7.2.1: WnE's Business Model (WnE, 2013)

8. The Projects Concerned

WnE currently operates 15 wind energy funds in north-western Germany. Due to the actual amendment of the EEG and the underlying repowering incentives, WnE considers to repower some of the older wind farms given that the repowering projects are economically feasible and provide a benefit for the investors. Two wind energy funds are of special interest for this master thesis and will be elaborated in detail in the subsequent chapters.

8.1. Windenergie Sustrum GmbH & Co. KG (WESU)

The wind energy fund Windenergie Sustrum GmbH & Co. KG (WESU) is the first realised project of WnE and was put into operation in December 1998. According to the wind energy fund prospectus, the feed-in tariff in the year 1998 amounted to 16.79 Pf/kWh. Since fixed feed-in tariffs were not yet granted at that time (applied for the first time as from 2000 with the implementation of the EEG), the liquidity forecast was based on a conservative average feed-in tariff in the amount of 16.25 Pf/kWh. This is equivalent to 8.31 ct/kWh[6]. The twenty-year business plan expects an annual yield of 9.2 % before taxes and a forecasted average distribution of 15.65 % per year on a twenty-year basis. A total of 173 limited partners invested in the fund and the limited partnership capital amounts to € 6,281,220.00. As can be seen in Figure 8.1.1, the wind farm is located in Sustrum in the northwest of the rural district Emsland, close to the Dutch border and the river Ems. Considering the 25 German wind regions as defined by the BDB-index, Sustrum belongs to wind region 10, which is one of the strong-wind regions in the North German lowlands. The landscape near the project site is characterised by arable land and spacious hedgerow countries. Furthermore, a minimum distance of 500 metres is maintained between the wind turbines and the nearest buildings (WESU, 1997). More details on distance requirements will be presented later in the study.

[6] The official EUR/DM exchange rate is 1.95583 (DBB, 2012).

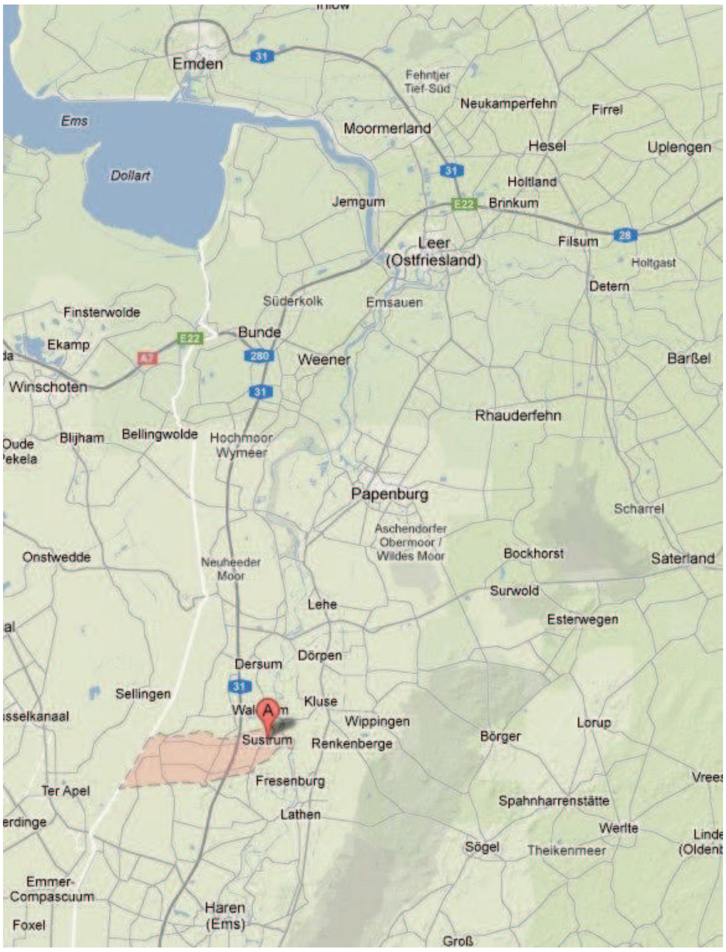


Figure 8.1.1: Location of Sustrum (Google Maps, 2013)

8.1.1. Type and amount of wind turbines

Figure 8.1.1.1 below illustrates the current wind farm configuration of WESU. The manufacturer TACKE Windenergie GmbH that was located in Salzbergen, Germany, delivered 10 wind turbines of the type TACKE TW 1.5i (now GE 1.5i) with a hub height of 80 metres, a rated power of 1.5 MW and a rotor diameter of 65 meters (Sustrum 1 to 10 as shown in Figure 8.1.1.1). According to the technical description of the wind turbine, the cut-in speed amounts to 4 m/s and the cut-out speed amounts to 25 m/s. The rated wind speed is reached at approximately 12.9 m/s. Further important technical specifications are the integrated automated power control through a pitch system and the three-stage planetary/spur gearing (WESU, 1997). It should be noted that TACKE Windenergie GmbH went bankrupt in the year 1997 and was acquired by Enron Wind Holding GmbH (WESU, 1997). However, since the year 2002 the company belongs to the US enterprise GE.

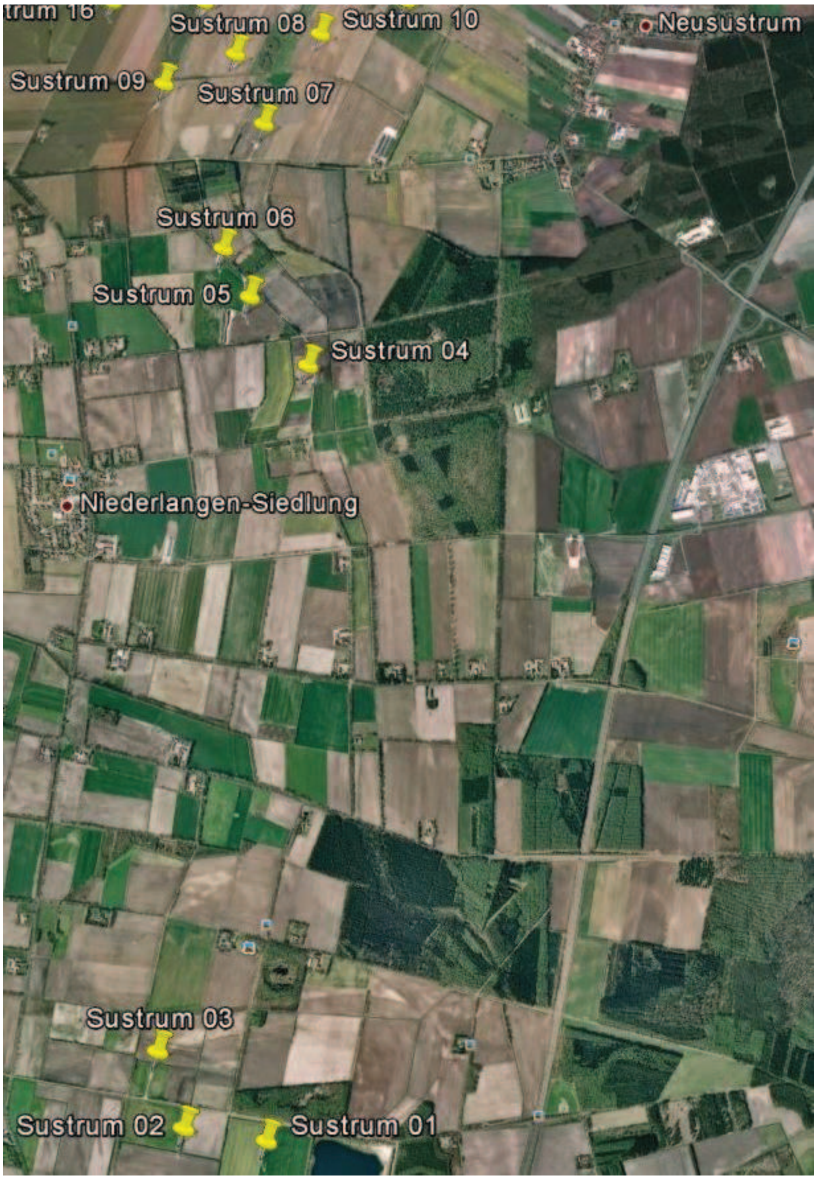


Figure 8.1.1.1: Wind Farm Configuration of WESU (WnE, 2013)

8.1.2. Profitability outlook of a no-change-strategy

In the following chapter the profitability of WESU will be forecasted by assuming that the operation of the existing wind farm will be continued without repowering. In order to evaluate the profitability of the wind energy fund in the future, a continuous operation of WESU until 2020 is assumed, although the original business plan of WESU comprised a project period from the year 1998 to the year 2018. Due to the implementation of the EEG in the year 2000, a fixed initial feed-in tariff in the amount of 17.8 Pf/kWh (9.1 ct/kWh) was granted for the first time. Section 7, paragraph 2 of the EEG 2000 specifies that existing installations are entitled to the initial feed-in tariff as from the entering into force of the law depending on the start-up date (EEG, 2000). In consequence of the EEG 2000, the WESU project is entitled to the fixed feed-in tariff starting from the year 2000. In the year 2020 the legally defined remuneration period with the guaranteed feed-in tariff of 9.1 ct/kWh will expire (WnE, 2013). Although the operation of WESU could potentially be continued even after the end of the remuneration period, the profitability outlook will only cover the period until 2020. Due to the unpredictability of the spot price of electricity from the year 2021 onwards, a reasonable forecast could not be made today. In Appendix A, three different scenarios for the continuation of WESU until 2020 are presented, a worst-case, an average-case and a best-case scenario. According to WnE, the year 2011 serves as a reasonable reference year for the profitability outlook. The decision for this reference year is based on a performance analysis of all company-owned wind farms. The analysis has shown that the year 2011 represents an average wind year in the wind region 10. Consequently, it is likely that on average an annual energy production comparable to the base year 2011 will be achieved in the future.

The Arbitax AG, an audit and tax consultancy firm situated in Oldenburg, Germany, updated the original budgeted financial performance of the WESU project from 1998 in the year 2004. Based on the updated financial forecast, the limited partners of WESU can expect a distribution of 22.17 % in 2012, 22.18 % in 2013, 24.77 % in 2014, 24.87 % in 2015, 24.90 % in 2016, 24.94 % in 2017 and 24.95 % in 2018 (Appendix B).

The following analysis will not focus on the out-of-date forecast by Arbitax AG, but on the average-case scenario, to be found in Appendix A. The profit and loss statement shows the expected revenues, the operational costs, the depreciation and the interest payments. It should be noted that WESU entails one speciality. The WESU fund partly invested in a wind turbine of another wind farm, which is also operated by WnE. As the wind turbine generates annual profits, WESU has to include its share in the profit and loss statement. The investment is indicated as WEA Dörpen.

In the average case scenario the forecasted annual electricity revenue is equal to the electricity revenue of the year 2011 and will stay constant until the year 2020. Additional earnings will be realised in the form of a market premium model through the direct selling of electricity as laid down in the EEG 2012, part 3a and onwards. Wind energy operators are allowed to directly sell their electricity at the energy exchange in Leipzig via an electricity trader. WnE entrusted the KEHAG Energiehandel GmbH situated in Oldenburg, Germany with the energy trading. The WnE management was able to negotiate special management premium rates (in ct/kWh) with KEHAG for the years 2012 to 2015, which can be found in Appendix A. By multiplying the negotiated management premium with the forecasted annual electricity production of the years 2012 to 2015, the additional revenue by means of direct selling can be calculated.

In contrast to the expected revenues of WESU, the development of the operational costs takes into account an annual inflation rate of 3 %, although the historical inflation rates were considerably lower in the recent past and exceeded the 3 % limit only once in the year 2007 (WID, 2013). This relatively high value is considered to be reasonable since a forecast should be calculated conservatively in order to include a financial buffer. It should be noted, that the full maintenance contract with GE will expire in mid-2014. Due to aging of the wind turbines and the higher probability of damage in the last years of the project phase, the costs for a new maintenance contract with GE are expected to increase significantly as from the year 2015. From the year 2016 onwards, the maintenance costs are budgeted to account for twice as much as for the year 2014. In the event of a severe gearing damage in one or even more of the aging wind turbines, the maintenance costs are budgeted in a manner to provide for a sufficient financial buffer to repair or even replace the damaged parts. Another important aspect of the operational costs is the increasing lease payments. According to the lease contracts between WESU and the respective property owners, a leasing rate of 4 % of the electricity revenue is paid in the first ten operating years (1998 to 2008), 6 % is paid as from the eleventh operating year (2009 to 2013) and 8 % is paid as from the sixteenth operating year (2014 to 2020). Additionally, a lump sum in the amount of € 5,000.00 is paid annually for sealed areas. Regarding depreciation it should be noted that the values are retrieved from the 2004 forecast carried out by Arbitax AG.

Due to the fact that WESU has been in operation since 1998, the last instalments for the loans taken out for the financing of the initial investment are paid in the year 2012. As from the year 2013 no further interest payments and redemptions are budgeted for the forecast.

A closer look at the liquidity forecast in the average scenario reveals that for the period from 2012 to 2020 the limited partners of WESU can expect a cumulative cash distribution of € 10,049,953.22 which is equivalent to 160 % of the limited partnership capital (€ 6,281,220.76).

8.2. Windpark Ohne GmbH & Co. KG (WP Ohne)

The wind energy fund Windpark Wietmarschen-Ohne GmbH & Co. KG was put into operation in 2001. Similar to WESU, the fund was set up in the legal form of a GmbH & Co. KG. According to the wind energy fund prospectus, the fixed feed-in tariff in the year 2001 amounts to 9.1 ct/kWh and is paid for a period of twenty years until 2021. As can be derived from the project name (Wietmarschen-Ohne), the wind energy fund consists of two different wind farms at two locations. In total, twelve wind turbines of the type Enron Wind 1.5sl (GE 1.5sl) are in operation, of which seven have been constructed at the location Ohne and five have been constructed at the location Wietmarschen. A total of 292 limited partners invested in the combined fund and the limited partnership capital amounts to € 6,650,000.00. The twenty-year business plan forecasted an average distribution of 12.38 % per year. Subsequently, the partial project Ohne will be solely discussed since a repowering potential in the form of an expansion of the actual wind farm exists. As can be seen from Figure 8.2.1, Ohne is located in the rural district Grafschaft Bentheim in Lower Saxony, close to the North Rhine-Westphalian border. Considering the 25 German wind regions as defined by the BDB-index, Ohne partly belongs to the wind regions 10 and 14 in the North German lowlands. The landscape near the project site is characterised by arable land, copses, hedges of trees and small woods. Accordingly, the surface roughness at the project site is low. Furthermore, the wind turbines were built at a height of 37 to 39 metres above sea level (WWO, 2001).

Figure 8.2.1: Location of Ohne (Google Maps, 2013)

The manufacturer Enron Wind GmbH, which took over Tacke Windenergie GmbH in 1997, delivered seven wind turbines of the type Enron Wind 1.5sl (GE 1.5sl) with a hub height of 100 metres, a rated power of 1.5 MW and a rotor diameter of 77 metres. According to the technical description of the wind turbines, the cut-in speed amounts to 3 m/s and the cut-out speed amounts to 20 m/s. The rated wind speed is reached at approximately 11.8 m/s. Further important technical specifications are the automated power control through a pitch system and the three-stage planetary gearing (WWO, 2001).

9. Repowering of WESU

As discussed in section 8.1.2, the original wind energy fund WESU was planned for a twenty-year period from 1998 to 2018. However, the remuneration period was prolonged to 2020 with the entry into force of the EEG in 2000. Due to the expiration of the full maintenance contract with GE in mid-2014 and the associated tremendous cost increase, the management of WnE is faced with the decision of whether to repower the wind farm in mid-2014 or to operate the current wind farm until 2020. The most important aspect affecting the decision-making is the satisfaction of the current investors (in total 173 limited partners).

According to the average case scenario of a no-change-strategy (as discussed in section 8.1.2 and presented in Appendix A), the limited partners of WESU can expect a cash distribution of 115 % (€ 7,223,403.87) on their paid-in limited partnership capital in the period from mid-2014 to 2020. In case of a repowering decision, the investors will not be willing to accept any financial loss and claim the forecasted distribution. Consequently, the repowering project will have to pay a financial compensation in the amount of the forecasted distribution, resulting in an additional financial burden for the new wind energy fund.

The question arises whether the repowering of WESU will still be profitable and generate a lucrative yield despite the additional financial burden?

Further, several limited partners budgeted the distributions to be paid in the years mid-2014 to 2020 for their private pension. Therefore, their approval for a further twenty-year repowering project starting in 2014 is very unlikely, unless a withdrawal from the new repowering project will be granted at the end of 2018 (similar to the planned termination date of the original WESU fund).

In addition to the financial considerations, legal implications also have to be taken into account. As presented in section 8.1 of the study, the wind farm in Sustrum (WESU) consists of ten wind turbines of the type GE 1.5i. A potential repowering has to be based on the land-use plan (Flächennutzungsplan), which is valid for the existing wind farm. Subsequently, the consequences of this constraint will be discussed in more detail.

9.1. Local legal regulations

In order to increase the annual energy production of a wind turbine, its hub height plays a crucial role. As revealed in the wind potential analysis in section 5.3, the wind speed increases with height. In the year 1998, when the wind farm in Sustrum was constructed, a height restriction of 182 metres above sea level was valid (WnE, 2013). According to Jann Berghaus, who is a lawyer and notary at the law office Berghaus, Duin und Kollegen in Aurich, the old height restriction will be abolished. Instead, the repowering installations can be built at a maximum height of 200 metres above natural soil (please refer to Appendix C for more information).

Furthermore, a minimum distance between a wind turbine and a detached residential house has to be kept in order to protect the local population. According to the regional spatial plan of the rural district Emsland, published in 2007 (Appendix D), the minimum distance to be maintained is 800 metres. Besides that, another distance constraint effects the spatial wind farm configuration. In order to generate the maximum annual energy production per wind turbine, the distance between the installations within a wind farm has to be optimised to avoid substantial wake losses. Figures 9.1.1, 9.1.2 and 9.1.3 illustrate the potential wind farm configuration of the WESU repowering project with seven wind turbines of the type E-101 / 3.0. Besides the Enercon turbine, the wind turbine GE 2.5-120 will also be considered for the repowering project (section 9.3 provides further details). The maps depict that a distance of at least 400 metres is kept between the installations in order to optimise the annual energy production.

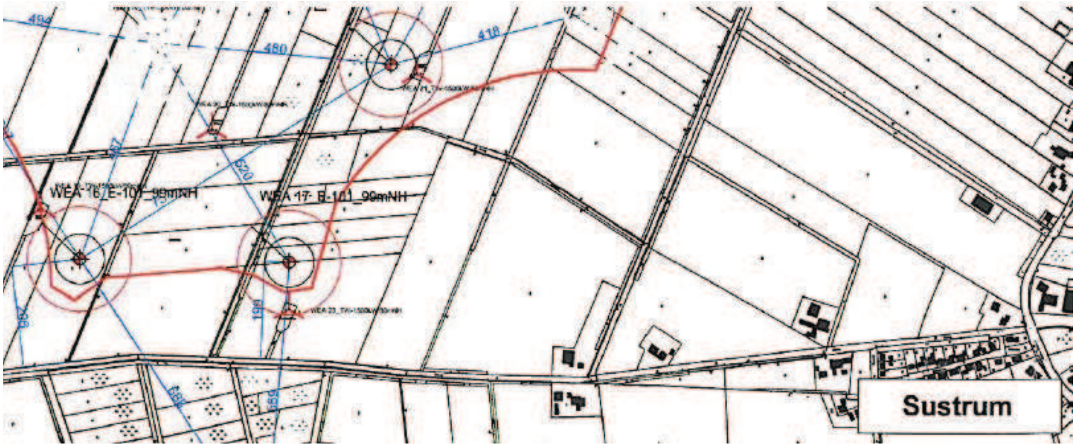


Figure 9.1.1: Map 1 of the Repowering of WESU (WnE, 2013)

As seen earlier in Figure 8.1.1.1, the current wind farm of WESU is widely spread over a large area. Figures 9.1.1 to 9.1.3 are excerpts of the entire wind farm and concentrate on the relevant areas for the repowering project. All ten existing GE 1.5i are illustrated in the maps and shown as a red rotor. The blue lines indicate the distance between the new repowering installations (E-101 / 3.0). Each new installation is mapped as three round circles: two black inner circles and one red outer circle. Due to the aforementioned distance constraints, it was found that the optimum number of repowering installations (E-101 / 3.0) is seven and therefore three less than the currently existing wind turbines. For reasons of simplification an equal number of new installations will be budgeted for the type GE 2.5-120.

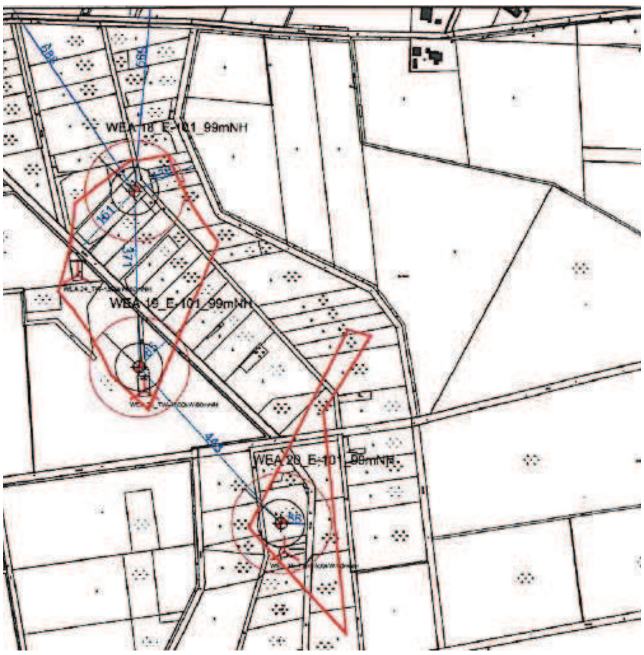


Figure 9.1.2: Map 2 of the Repowering of WESU (WnE, 2013)

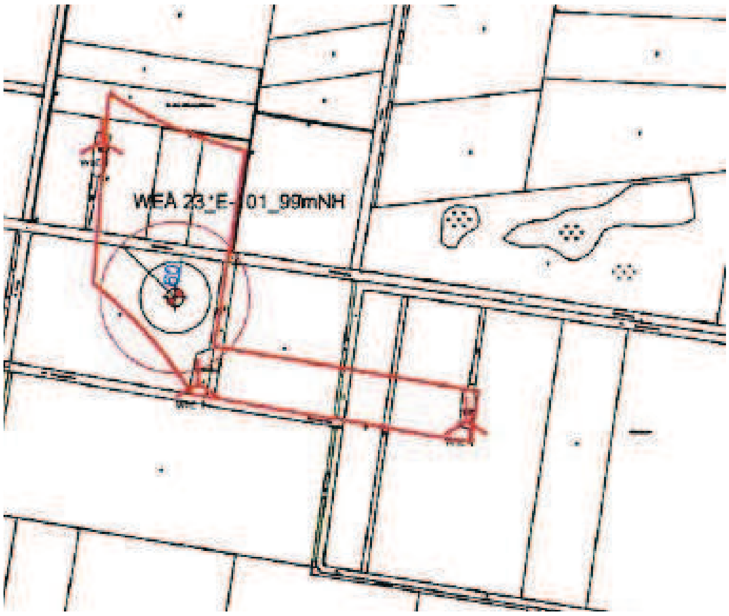


Figure 9.1.3: Map 3 of the Repowering of WESU (WnE, 2013)

9.2. Wind potential in Sustrum

For the repowering project in Sustrum no analysis of the wind potential has been conducted yet. Due to the lack of profound wind data, the determination of the wind potential in Sustrum will be deduced from a professional wind analysis of the project site Ohne, which was carried out by anemos in October 2012. The final results of the wind potential in Ohne will be discussed later in this study and presented in detail in section 10.2.

It should be noted that the distance between Sustrum and Ohne amounts approximately 80 kilometres, resulting in different wind conditions at both sites. Sustrum is located further to the north and closer to the coast. Thus, the wind potential is expected to be greater. In order to determine the magnitude of the differing wind conditions at both sites, the recent energy production of identical installations of the type GE 1.5sl in Sustrum and Ohne will be compared. The time frame 2005 to 2012 will serve as a calculation basis.

As can be seen in Figure 9.2.1, two GE 1.5sl with a hub height of 80 metres are currently operated in the existing wind farm in Sustrum. In the years 2005 to 2012 both installations produced 50,244 MWh, which is equal to an average annual production of 6,281 MWh. Consequently, the average annual energy production per wind turbine is equal to 3,140 MWh. In the same period, seven GE 1.5sl with a hub height of 100 metres produced 153,201 MWh in the wind farm Ohne, which is corresponding to an average annual production of 19,150 MWh. In this case the average annual energy production per wind turbine is equal to 2,736 MWh. In order to compare the annual energy production per wind turbine in Sustrum (3,140 MWh) and Ohne (2,736 MWh), the difference of 20 metres in the hub height has to be taken into account. As discussed in section 5.1 of the study, a one-metre increase in height is expected to increase the annual energy production by 1 % (AEE, 2010). Thus, the annual energy production per wind turbine with a hub height of 100 metres in Ohne (2,736 MWh) has to be adjusted by minus 20 % (2,189 MWh) in order to compare it to the annual energy production per wind turbine in Sustrum. As illustrated in Figure 9.2.1, the analysis reveals that wind turbines in Sustrum produced 30 % more than identical installations in Ohne throughout an 8-year period.

Wind Farm Sustrum - Energy Production 2005 to 2012

WEA- Type: GE 1.5 SL
Hub Height: **80 m**
Amount of WT: 2

WT / Year	2005	2006	2007	2008	2009	2010	2011	2012	cum	Average	Unit
Wind Turbine 1	3.163	3.450	3.617	3.515	3.214	2.656	3.392	3.157	26.165	3.271	MWh
Wind Turbine 1	2.862	3.016	3.419	3.448	2.914	2.436	3.136	2.847	24.079	3.010	MWh
Sum WT	**6.025**	**6.466**	**7.037**	**6.963**	**6.128**	**5.092**	**6.529**	**6.005**	**50.244**	**6.281**	**MWh**

Total average yield: 6.281 MWh
Average yield per WT: **3.140 MWh**

Wind Farm Ohne - Energy Production 2005 to 2012

WEA- Type: GE 1.5 SL
Hub Height: **100 m**
Amount of WT: 7

WT / Year	2005	2006	2007	2008	2009	2010	2011	2012	cum	Average	Unit
Wind Turbine 1	2.605	2.894	3.091	3.002	2.609	2.331	2.895	2.857	22.283	2.785	MWh
Wind Turbine 2	2.663	2.584	3.126	3.103	2.767	2.330	2.894	2.728	22.193	2.774	MWh
Wind Turbine 3	2.642	2.844	2.986	3.018	2.615	2.104	2.770	2.796	21.775	2.722	MWh
Wind Turbine 4	2.536	2.812	2.964	3.003	2.679	2.237	2.823	2.717	21.771	2.721	MWh
Wind Turbine 5	2.538	2.675	3.006	3.068	2.657	2.284	2.805	2.510	21.542	2.693	MWh
Wind Turbine 6	2.637	2.906	3.037	2.936	2.847	2.354	2.984	2.827	22.527	2.816	MWh
Wind Turbine 7	2.510	2.713	2.812	2.935	2.662	2.181	2.788	2.508	21.110	2.639	MWh
Sum WT	**18.130**	**19.427**	**21.023**	**21.065**	**18.837**	**15.820**	**19.958**	**18.941**	**153.201**	**19.150**	**MWh**

Total average yield: 19.150 MWh
Average yield per WT: 2.736 MWh
Based on 80 m HH: **2.189 MWh** (minus 20 % due to 20 m hub height difference between WT in Ohne and Sustrum)

Comparison of the Energy Production in the Wind Farms Sustrum and Ohne

Sustrum - Yield per WT (80 m HH): 3.140.266 kWh
Ohne- Yield per WT (80 m HH): 2.188.591 kWh
Additional Yield in Sustrum **30%**

Figure 9.2.1: Comparison of the Energy Production in Sustrum and Ohne (WnE, 2013)

Due to the aforementioned research results, the expected annual energy production as calculated by anemos for the project site Ohne (Figure 10.2.4) will have to be adjusted by 30 %. By doing this, the differences in terms of the wind potential in

Sustrum and Ohne will be compensated and the available data by anemos can be used for the business plan of the repowering of WESU.

9.3. Types of wind turbines to be considered

The German onshore wind energy market is very competitive with regard to numerous wind turbine manufacturers. In order to narrow down the choice which type of wind turbine will be installed in the repowering projects of WnE, the manufacturers Enercon and GE were contacted first to make an offer. The reasoning behind this decision was the long-standing business relationships with both manufacturers.

Enercon presented a tailor-made offer with respect to the local conditions for both project sites in Sustrum and Ohne. The turbine is referred to as E-101 / 3.0 with specific hub heights of 135 metres and 125 metres for Sustrum and Ohne, respectively. Further, the rotor diameter has a total length of 101 metres and the wind turbine has a rated power of 3.0 MW.

In contrast, GE handed in a tailor-made offer for the type GE 2.5-120 with specific hub heights of 139 metres and 110 metres for Sustrum and Ohne, respectively. The rotor diameter has a total length of 120 metres and the wind turbine has a rated power of 2.5 MW.

9.4. Conception of the WESU repowering project

The simplest way to repower the existing wind energy fund WESU would be the replacement of the existing wind turbines (10 GE 1.5i) in mid-2014 by seven repowering installations. However, this would mean a prolongation of the original WESU fund by 16 years (planned duration until 2018, new duration until 2034) since the repowering project would again be based on a twenty-year time frame. As discussed in section 9, this decision would contradict the will of some of the current investors.

Another option is the establishment of two new wind energy funds in the form of a GmbH & Co. KG in mid-2014.

The first fund, WESU Repowering, will take over the original WESU fund in mid-2014 and operate three of seven repowering installations. It should be noted that the investor structure of WESU Repowering would remain the same as for the original

WESU fund (173 limited partners with a limited partnership capital of € 6,281,220.76). In order to keep the conditions of the original investment, the newly established WESU Repowering will only operate until the end of 2018. In so doing, the termination of the original investment in 2018 in accordance with the twenty-year plan of WESU is guaranteed. Further, the expected cash distribution of 115 % (€ 7,223,403.87) on the paid-in limited partnership capital in the period from mid-2014 to 2020 (as discussed in section 8.1.2 and presented in Appendix A) will be fully executed. Due to the termination of WESU Repowering in 2018, only the forecasted distribution from mid-2014 to 2018 will be paid on an annual basis. The additional distribution for the years 2019 and 2020 will be paid in the form of a one-time payment in mid-2014 in the amount of € 1,265,205.60. Figure 9.4.1 illustrates the underlying net present value calculation[7] in order to derive the mathematically correct value of the additional cash distribution in mid-2014.

Net Present Value (NPV) Calculation

Year	Period (n)	Discount Rate (p) *1	Distribution in %	Distribution in € (K_1)	NPV in € (K_0)	
2014	0,5	0,0435	9%	565.310	553.402	
2015	1,5	0,0435	20%	1.256.244	1.178.516	
2016	2,5	0,0435	20%	1.256.244	1.129.387	
2017	3,5	0,0435	20%	1.256.244	1.082.307	
2018	4,5	0,0435	20%	1.256.244	1.037.189	
2019	5,5	0,0435	13%	816.559	646.069	646.069
2020	6,5	0,0435	13%	816.559	619.137	619.137
cum.			**115%**	**7.223.404**	**6.246.006**	**1.265.206**

*1 According to the German Central Bank: Abzinsungszinssatztabelle der Deutsche Bundesbank 31.03.2013

Figure 9.4.1: NPV Calculation of Expected Cash Distribution of WESU

As from 2019, WESU Repowering will be acquired by a third wind energy fund WP Sustrum Süd. This approach leads to several advantages. Firstly, all contractual obligations in terms of the project duration of the WESU Original fund will be fulfilled. Beyond that, the former limited partners of WESU Original will have the opportunity to reinvest in WP Sustrum Süd, which will then be operated until 2034. Secondly, the financing structure of WP Sustrum Süd can be reorganised and the limited partnership capital, serving as a basis for the annual cash distributions, will be reduced significantly in comparison to the limited partnership capital of WESU Original (€ 6,281,220.76). This will lead to a financial relief for the repowering

[7] The formula to calculate the net present value, where K_0 = net present value, K_1 = future cash flow, p = discount rate and n = time of the cash flow reads as follows: $K_0 = \frac{K_1}{(1+\frac{p}{100})^n}$ (Richard and Schwitala, 2003).

project. More details will follow in section 9.5, presenting the financial analyses of the investments in the wind turbines E-101 / 3.0 and GE 2.5-120.

The second fund, WP Sustrum Nord, will operate the remaining four repowering installations. Since the location rights of the respective installations belong to the original WESU fund, WP Sustrum Nord will buy four location rights in the amount of € 100,000.00 per MW per repowering installation. Additionally, the fund will compensate the additional cash distribution for the limited partners of WESU Original for the years 2019 and 2020, accounting for € 1,265,205.60 as illustrated above. In contrast to WESU Repowering and WP Sustrum Süd, WP Sustrum Nord will be fully operated on a twenty-year period from mid-2014 to 2034.

9.5. New investments: E-101 / 3.0 and GE 2.5-120

In order to assess the feasibility of the repowering of WESU in mid-2014, the investment costs of the project have to be determined. As the analysis will be based on two different types of wind turbines (Enercon and GE), both investments and the respective feasibility studies will be presented separately. At first, the investment in the type E-101 / 3.0 will be evaluated followed by the investment in the type GE 2.5-120.

9.5.1. Financing of WESU Repowering and WP Sustrum Süd: E-101

The first step in the financial analysis is the determination of the total capital costs. Appendix E lists the different cost positions which have to be taken into account for the wind energy funds WESU Repowering and WP Sustrum Süd. Except for the official offering price of the E-101 / 3.0 by Enercon, all cost positions including the costs for compensation measures, project development, interest payments until start-up, connection to the grid, transformer station (Umspannwerk), infrastructure, right of special use, supervision until start-up and miscellaneous are based on estimates. It should be noted that the estimations are deduced from the cost structure of past wind farm projects of WnE and are verified by Jürgen Coßmann, the project controller of WnE. In total, capital costs of € 14,545,000.00 are budgeted for the investment in three E-101 / 3.0 wind turbines.

The investment plan of WESU Repowering, which is presented in Appendix F, gives an overview of the project financing. The German promotional bank Kreditanstalt für Wiederaufbau (KfW) offers special financing conditions for renewable energy projects, including the financing of wind energy. Normally, a limited partnership capital of about 20 to 25 % is required in order to get a credit commitment (according to Jürgen Coßmann). In the case of WESU Repowering, the limited partnership capital of the original WESU fund (€ 6,281,220.76) will be taken over so that no additional limited partnership capital will be collected for the financing of the repowering investment. Thus, the full capital costs will be financed by two KfW loans of the type Erneuerbare Energien Standard, specified with the product number 270 (KfW, 2013). Two different payback periods will be chosen. The first loan will have to be paid back after 10 years and the second after 15 years. The KfW grants a grace period of 2 and 3 years, respectively (KfW, 2013). Further, the average payback period of both loans should not exceed 13.5 years (WnE, 2013). In order to fulfil this requirement, € 4,800,000.00 (33 % of the total investment costs) will be paid back within a period of 10 years and € 9,745,000.00 (67 %) after 15 years. Currently, the KfW offers annual effective interest rates starting from 1.31 %. As the expansion project is planned for mid-2014, the interest rates could potentially increase until the financing is finally contracted. In order to take into account the interest rate risk, the calculations are not based on the offered 1.31 %, but on fixed interest rates of 2 % for the ten-year loan and 2.5 % for the first 10 years of the fifteen-year loan. After 10 years the interest rate has to be renegotiated for the last 5 years of the second loan. In the calculation a doubling of the initial interest rate is budgeted.

The investment plan of WP Sustrum Süd (details on calculations are presented in Appendix G), the wind energy fund that will take over WESU Repowering in the year 2019, is structured in the same manner except for two differences. Firstly, the limited partnership capital will be reduced significantly from € 6,281,220.76 to € 3,200,000.00. Secondly, an additional bank loan amounting to € 1,500,000.00 will be taken out. The interest rate for an ordinary bank loan is expected to be higher than for the above-mentioned KfW loans and is budgeted with an annual rate of 4 %. A payback period of ten years is assumed. The loan is needed because the E-101 / 3.0 wind turbines will still have a high value at the end of the year 2018. Therefore, the limited partners of WSEU Repowering will claim a financial compensation for the installations. WP Sustrum Süd will buy the installations for an adequate price of € 500,000.00 each. The required loan will be financed to 100 %.

9.5.2. Feasibility of WESU Repowering and WP Sustrum Süd: E-101

As discussed in section 9.2, the expected annual energy production will be derived from a professional wind analysis for the wind farm in Ohne. Figure 9.2.1 revealed that the energy production of identical installations was 30 % higher in Sustrum than in Ohne. Thus, the expected annual energy yield as depicted in Figure 10.2.4 will have to be adjusted upwards by 30 % in order to be representative for the project site in Sustrum. Additionally, the original wind analysis by anemos was carried out for E-101 / 3.0 turbines with a hub height of 125 metres, while the installations in Sustrum will be constructed with a hub height of 135 metres. Since a one-metre increase in hub height is expected to increase the annual energy production by 1 % (as discussed in section 5.1), the data from the original wind analysis will further be adjusted by 10 %. Multiplying the expected annual energy production of 17,604 MWh (for the wind farm in Ohne) by 140 % yields to the respective value for Sustrum. However, the wake loss in Sustrum is expected to be higher than for the wind farm in Ohne since the amount of installations in the entire wind farm area (currently 29 in Sustrum: 10 WESU, 6 WISTRO and 13 BVT installations) exceeds the number of installations, which were considered in the original wind analysis (16 in Ohne). Consequently, a deduction of 5 % is budgeted for additional wake losses in Sustrum. Further deductions will be made for the technical availability (3 %), transmission losses (2 %) and for a safety margin (10 %). The resulting annual energy production is multiplied by the sum of the initial tariff (8.66 ct/kWh in 2014) and the repowering-bonus (0.49 ct/kWh in 2014), so that an annual revenue of € 1,810,961.70 is expected to be generated. In Appendices F and G the detailed calculations are presented.

WESU Repowering

In addition to the annual feed-in remuneration, WESU Repowering will generate extraordinary revenues in mid-2014 (Appendix H). As already mentioned in section 9.4, WESU Repowering will operate three repowering installations. The remaining four location rights in the wind farm Sustrum in the amount of € 100,000.00 per MW per repowering installation will be sold to WP Sustrum Nord. This adds up to € 1,200,000.00 in total. Further, the original WESU fund partly invested in a wind turbine of another wind farm (as presented in section 8.1.2). In the course of the repowering project, the share in the wind turbine WEA Dörpen will be sold, yielding a revenue of € 625,000.00.

The next position in the profit and loss forecast is the sale of unused repowering rights. As indicated in section 9.1 of the study, only seven repowering installations will replace the ten existing GE 1.5i wind turbines of WESU. Since WESU Repowering will operate three installations, seven repowering rights can be sold to other operators. Four repowering rights will be sold to WP Sustrum Nord and three to the expansion project of the wind farm in Ohne. Both, the seller of the repowering rights (WESU Repowering) and the buyer (WP Sustrum Nord and the operator of the expansion of WP Ohne) want to receive an economic advantage. Thus, the generated income in the form of the repowering-bonus will be equally divided. The repowering-bonus in the year 2014 amounts to 0.49 ct/kWh (as shown in section 6.1) and will be paid for a period of twenty years. Multiplying this value by the forecasted annual energy production per wind turbine (as calculated above), the annual repowering-bonus in the amount of € 32,326.82 can be achieved. Considering the twenty-year remuneration period, the total value amounts to € 646,536.42. One half of the repowering-bonus has to be paid out in the form of a one-time payment at the beginning of the project lifetime in mid-2014 in order to fulfil the 50 % share of WESU Repowering in the repowering rights. Consequently, the mathematically correct value of the repowering-bonus has to be derived by calculating the net present value. According to the German Central Bank (Deutsche Bundesbank), the correct discount rate (as from 31 March 2013) for a period of twenty years is 5.07 % (DBB, 2013). Appendix I illustrates the application of the net present value calculation in detail. The results show that the total value of the repowering-bonus decreases from initially € 646,536.42 to € 400,605.67, of which one half (€ 200,302.83) will be paid to WESU Repowering in mid-2014. In total, the additional revenue in the form of the sale of seven repowering rights yields € 1,402,119.84.

The last extraordinary gain for WESU Repowering in mid-2014 is the additional distribution to the limited partners for the years 2019 and 2020, which will be paid in the form of a one-time payment. In section 9.4 and Figure 9.4.1 of the study, the concept of the payment and the underlying net present value calculation were clarified. In total, € 1,265,205.60 will be compensated by WP Sustrum Nord.

In the year 2018, the year of divestment of WESU Repowering, WP Sustrum Süd will take over the three E-101 / 3.0 installations. As discussed in section 9.5.1, the limited partners of WESU Repowering will get a financial compensation in the amount of € 500,000.00 per wind turbine, leading to an extraordinary gain of € 1,500,000.00.

Besides the revenues in the years from mid-2014 to 2018, Appendix H also illustrates the operational costs. Annual expenses such as insurance costs, electricity self-demand or miscellaneous are deduced from the cost structure of former wind farm projects of WnE and are revised by the project controller, Jürgen Coßmann. As discussed in section 8.1.2 of the study, an annual cost increase due to an inflation rate of 3 % is expected. On the contrary, the annual lease payments are budgeted in accordance with the valid lease contract for WESU. As laid down, a leasing rate of 6 % of the electricity revenue is paid in the first ten years. As from the eleventh year, the rate increases to 8 %. Additionally, € 0.25 per m² is paid for a maximum sealed area of 4,000 m² (WnE, 2013). On average, the forecast accounts for an annual extra amount of € 750.00 per wind turbine. Further, maintenance is budgeted according to the conditions of the Enercon-Partner-Konzept, which are specified in Appendix H and are based on an offer from 13 July 2012.

Depreciation and financing costs constitute the largest part of the annual expenses. It should be noted that a depreciation period of 16 years is assumed (BFH, 2011), in which the total capital costs are depreciated annually on a straight-line basis (€ 909,062.50). Both KfW loans are instalment loans, meaning that the annual instalment consists of a constant repayment and a gradually decreasing interest payment over the duration of the loan.

Finally, the profit and loss forecast of WESU Repowering reveals a cumulative profit of € 7,159,175.45, generated throughout the period mid-2014 to 2018. The original limited partners of WESU will benefit from the repowering project in two ways. Firstly, the expected cash distribution of 115 % on the limited partnership capital will be fully paid (as discussed in sections 8.1.2 and 9.4 as well as presented in Appendix A). Secondly, an additional distribution amounting to 51 % (€ 3,203,422.59) will be paid until the divestment of WESU Repowering in 2018.

WP Sustrum Süd

As mentioned before, WESU Repowering will be divested to WP Sustrum Süd at the end of 2018. Appendix J provides an overview of the repowering project phase from the years 2019 to 2034.

In contrast to WESU Repowering, no extraordinary gains will be generated until the termination of the project, but only the annual feed-in remuneration in the amount of € 1,810,961.70. Since the operation of WESU Repowering will be taken over by WP Sustrum Süd, all operational and financing costs will be structured in the same manner as discussed above. However, three crucial aspects should be noted. Firstly, maintenance costs (Enercon-Partner-Konzept) are budgeted to increase by 50 % as from the year 2029. The reason for this is the expiration of the maintenance contract after 15 years. A new contract will have to be negotiated and the costs are expected to increase tremendously due to the increasing risk of damage of the installations. Secondly, the fixed interest rate of 2.5 % for the 15-year KfW loan is only valid for the first ten years (as discussed in section 9.5.1). After 10 years, the interest rate has to be renegotiated for the last 5 years. In the calculation a doubling of the initial interest rate as from the year 2024 is budgeted. Thirdly, the additional 10-year bank loan amounting to € 1,500,000.00 (as discussed in section 9.5.1) will increase the financing costs of WP Sustrum Süd in comparison to WESU Repowering.

Taking into account the aforementioned peculiarities of WP Sustrum Süd, the profit and loss forecast reveals that a cumulative profit of € 4,534,414.75 will be generated throughout the years 2019 to 2034, resulting in a maximum cumulative cash distribution of 177.50 %. Deducting the paid-in capital of 100 %, the annualised excess yield accounts for approximately 4.84 % (= 77.50 % ÷ 16 years) as can be seen in Appendix K.

9.5.3. Financing of WP Sustrum Nord: E-101

Similarly to the financial analysis in section 9.5.1, the first step is the determination of the total capital costs. Appendix L lists the different cost positions, which have to be taken into account for the wind energy fund WP Sustrum Nord. The cost positions location rights, compensation of additional distributions for the years 2019 and 2020 as well as repowering-bonus are added. All remaining cost positions are exactly the same as budgeted for the investment of WESU Repowering and WP Sustrum Süd. As discussed in section 9.4 of the study, WP Sustrum Nord will buy four location rights from WESU Repowering in the amount of € 1,200,000.00. Further, the fund will compensate the additional distribution for the limited partners of WESU Original for the years 2019 and 2020, accounting for € 1,265,205.60. The determination of the last cost position, the repowering-bonus, is illustrated in section 9.5.2. The calculations show that € 200,302.83 per wind turbine (E-101 / 3.0) will have to be paid to WESU Repowering in mid-2014 (details on calculations to be found in Appendix I). Since WP Sustrum Nord plans to operate four installations, a total amount of € 801,211.33 will increase the initial investment costs. In total, capital costs of € 22,641,417.33 are budgeted for the investment in four E-101 / 3.0 wind turbines.

The investment plan of WP Sustrum Nord, presented in Appendix M, gives an overview of the project financing. Due to common practice of WnE, a financial buffer in the form of a liquidity reserve of about 2 to 4 % is added to the total capital costs, yielding total investment costs of € 23,300,000.00. In order to finance the investment, a limited partnership capital of € 5,400,000.00 (23.18 % of the total investment costs) will be collected. According to Jürgen Coßmann, a limited partnership capital of about 20 to 25 % is required to get a credit commitment. The remainder is financed via two KfW loans of the type Erneuerbare Energien Standard (KfW, 2013). Again, the same loan conditions apply as for WESU Repowering (as illustrated in section 9.5.1). The 10-year loan amounts to € 6,000,000.00 (25.75 % of the total investment costs) and the 15-year loan to € 11,900,000.00 (51.07 %).

9.5.4. Feasibility of WP Sustrum Nord: E-101

In Appendix M the determination of the expected annual energy production is illustrated. As discussed in detail in section 9.5.2 of the study, the annual energy production is derived from a professional wind analysis by anemos for the wind farm in Ohne. For WP Sustrum Nord the same assumptions as for WESU Repowering and WP Sustrum Süd are applicable. The only difference is that WP Sustrum Nord will operate four installations instead of three, which results in a higher annual revenue of € 2,414,615.60.

The annual expenses, as shown in Appendix N, are based on the same calculation method as presented in section 9.5.2 for WESU Repowering and WP Sustrum Süd. Nevertheless, the annual operational costs are proportionately higher due to the fact that one more wind turbine is in operation.

Finally, the profit and loss forecast of WP Sustrum Nord shows a cumulative profit of € 7,284,019.01 throughout the period mid-2014 to 2034, resulting in a cumulative cash distribution of 216 %. Deducting the paid-in capital of 100 %, the annualised excess yield accounts for approximately 5.80 % (= 116 % ÷ 20 years), as can be seen in Appendix O.

9.5.5. Evaluation of the performance forecast: E-101

Considering the results of the financial and feasibility analyses it can be concluded that the limited partners of WESU Repowering (or WESU Original) will benefit considerably from the repowering of the original WESU fund. Not only the expected cash distribution of 115 % will be guaranteed, but also an additional distribution of 51 % will be paid until the divestment of WESU Repowering in 2018. However, the feasibility analysis of WP Sustrum Süd shows a different picture. WnE targets a minimum cumulative cash distribution of 260 % on the paid-in limited partnership capital over a project period of 20 years. This is equivalent to an annual excess distribution of 8 % (the paid-in capital of 100 % has to be deducted to derive the excess distribution: 160 % ÷ 20 years). Comparing the target value with the forecasted annual excess distribution of WP Sustrum Süd, 4.84 % (as calculated in section 9.5.2), it becomes clear that the project cannot be realised under these conditions. An analysis of the selling price for the E-101 wind turbine shows that the current investment costs per kWh account for € 0.73 (as illustrated in Appendix K). In order to achieve an annual excess distribution of 8 % (= 128 % ÷ 16 years), the cumulative cash distribution throughout the 16-year project WP Sustrum Süd has to equal 228 % (currently 177.50 %). Enercon would have to reduce the selling price per E-101 / 3.0 by remarkable 10.95 % in order to reach the value. The reduction would lead to a decrease of the investment costs per kWh from € 0.73 to € 0.67.

Likewise, WP Sustrum Nord will also fail to reach the minimum target of an annual excess distribution of 8 %. As discussed in section 9.5.4, the annual excess distribution over the project period of 20 years amounts to 5.80 %. Similar to WP Sustrum Süd, Enercon will have to reduce the selling price for the E-101 wind turbine. Currently, the investment costs per kWh account for € 0.88 (as illustrated in Appendix O). A reduction of the selling price by 9.55 % will be needed to reach a cumulative cash distribution of 260 % (currently 216 %). In other words, the investment costs per kWh have to be reduced from € 0.88 to € 0.82.

9.5.6. Financing of WESU Repowering and WP Sustrum Süd: GE 2.5

The investment in GE 2.5 installations, as illustrated in Appendix P, is similar to the investment in E-101 wind turbines, which was discussed in detail in section 9.5.1 of the study and depicted in Appendix E. The total capital costs solely differ in the level of the selling price, which is 8.59 % lower for a GE 2.5 wind turbine compared to an E-101 wind turbine. In total, capital costs of € 13,465,000.00 are budgeted for the investment in three GE 2.5 installations.

The investment plan of WESU Repowering is presented in Appendix Q, providing an overview of the project financing. As the investment in GE 2.5 is analogous to the above-described investment in E-101, the project financing of both investments is structured in the same manner (the details were highlighted in section 9.5.1). Since the limited partnership capital of WESU Original will be taken over by WESU Repowering (€ 6,281,220.76), the full capital costs will be financed by two KfW loans with identical loan conditions as introduced in section 9.5.1 (KfW, 2013). The 10-year loan will account for € 4,800,000.00 (35.65 % of the total investment costs) and the 15-year loan for € 8,665,000.00 (64.35 %).

Appendix R gives an overview of the investments plan of WP Sustrum Süd. In the course of the divestment of WESU Repowering to WP Sustrum Süd, the original limited partnership capital will be reduced from € 6,281,220.76 to € 3,000,000.00. Again, an additional bank loan (€ 1,500,000.00) to compensate the limited partners of WESU Repowering for the value of the installations at the end of 2018 will be taken out (according to the loan conditions as specified in section 9.5.1).

9.5.7. Feasibility of WESU Repowering and WP Sustrum Süd: GE 2.5

In section 9.5.2 the derivation of the expected annual energy production for the project site Sustrum was discussed in detail. It was pointed out that the expected annual energy yield, as depicted in Figure 10.2.4, would have to be adjusted by 30 % (as illustrated in Figure 9.2.1). Further, the hub height difference between the installations in Ohne (110 metres) and Sustrum (139 metres) has to be considered to derive an adequate estimation of the annual energy production in Sustrum. Consequently, the data from the original wind analysis will further be adjusted by 29 %. Multiplying the expected annual energy production of 19,052 MWh (for the wind farm in Ohne) by 159 % yields the respective value for Sustrum. With respect to the required deductions, the same assumptions as used in section 9.5.2 apply.

One major difference in the feed-in tariff has to be noted when comparing the investments in E-101 / 3.0 and GE 2.5-120. As laid down in section 30 (1) of the EEG, the repowering-bonus is only granted if the installed capacity of the repowering installations amount to at least two times that of the installations they replace (EEG, 2012). In the case of GE, installations with 1.5 MW installed capacity are replaced by 2.5 MW so that the requirement is not met. Hence, the annual energy production is multiplied by the initial tariff (8.66 ct/kWh in 2014) without the repowering-bonus (0.49 ct/kWh in 2014). An annual revenue of € 2,106,776.76 is expected to be generated. In Appendix Q and Appendix R the detailed calculations are presented.

WESU Repowering

Appendix S reveals that WESU Repowering will generate extraordinary revenues in mid-2014. The details were already highlighted in section 9.5.2. Two differences compared to the investment in E-101 have to be noticed. Firstly, the revenue for four location rights to be sold to WP Sustrum Nord will amount to € 1,000,000.00, which is € 200,000.00 less compared to the investment in E-101. This is due to the fact that the value of a location right is related to the rated power of a wind turbine (€ 100,000.00 per MW). Since the GE wind turbine has a rated power of 2.5 MW (compared to 3.0 MW of E-101), WP Sustrum Nord will have to pay less for the location rights. Secondly, the extraordinary revenue for seven unused repowering rights will not be generated since the repowering-bonus will not be granted (as discussed above).

At the end of 2018, WESU Repowering will sell three GE 2.5 wind turbines to WP Sustrum Süd, which leads to an extraordinary gain in the amount of € 1,500,000.00 (details were discussed in sections 9.5.1 and 9.5.2).

In Appendix S the operational costs of the period mid-2014 to 2018 are illustrated. All assumptions made for an investment in E-101 wind turbines (as pointed out in section 9.5.2) with regard to costs positions such as insurance costs, electricity self-demand or miscellaneous are applicable for the investment in GE 2.5 as well. However, the development of costs for maintenance shows a different picture. The conditions of the Vollabsicherungs-Konzept by GE are specified in Appendix S and are based on an offer from 13 February 2013.

Again, a depreciation period of 16 years is assumed (BFH, 2011), in which the total capital costs are depreciated annually on a straight-line basis (€ 841,562.50). Both KfW loans are instalment loans. The consequences were already discussed in section 9.5.2.

Taking into account all aforementioned revenue and cost positions, the profit and loss forecast of WESU Repowering reveals a cumulative profit of € 6,409,646.25 throughout the period mid-2014 to 2018. As mentioned in section 9.5.2, the limited partners of the WESU Original fund will benefit from the repowering project in two ways. Firstly, the expected cash distribution of 115 % on the limited partnership capital will be fully paid (as discussed in sections 8.1.2 and 9.4 as well as presented in Appendix A). Secondly, an additional distribution amounting to 37.50 % (€ 2,355,457.79) will be paid until the divestment of WESU Repowering in 2018. Comparing these results with the investment in E-101 installations (51 % additional distribution in the amount of € 3,203,422.59 as described in section 9.5.2), it can be concluded that WESU Repowering will be more profitable when investing in E-101 wind turbines.

WP Sustrum Süd

Appendix T provides an overview of the repowering project phase from the years 2019 to 2034, describing the years after the divestment of WESU Repowering.

The annual feed-in remuneration amounts to € 2,106,776.76. Since the operation of WESU Repowering will be taken over by WP Sustrum Süd, all operational and financing costs will be structured in the same manner as discussed above. Since the Vollabsicherungs-Konzept by GE will only be valid for 15 years, maintenance costs are expected to increase by 50 % as from the year 2029. Further, the fixed interest rate of 2.5 % for the 15-year KfW loan will have to be renegotiated after 10 years. Therefore, a doubling of the initial interest rate is budgeted as from the year 2024. Lastly, the additional 10-year bank loan amounting to € 1,500,000.00 (as discussed in the course of WESU Repowering) will increase the financing costs of WP Sustrum Süd.

Finally, the profit and loss forecast shows a cumulative profit of € 9,238,208.86 generated throughout the years 2019 to 2034. This results in a maximum cumulative distribution of 328 %. Deducting the paid-in capital of 100 %, the annual excess yield sums to approximately 14.25 % (= 228 % ÷ 16 years) as can be seen in

Appendix U. In comparison, an investment in E-101 wind turbines only generates a cumulative profit of € 4,534,414.75 with a maximum cumulative distribution of 177.50 % (as discussed in section 9.5.2).

9.5.8. Financing of WP Sustrum Nord: GE 2.5

Appendix V lists the different cost positions which have to be taken into account for the wind energy fund WP Sustrum Nord. The structuring of the investment costs was presented in detail in section 9.5.3 of the study. Two differences compared to the investment in E-101 wind turbines can be identified. Firstly, the amount to be paid to WESU Repowering for four location rights is € 200,000 less and adds up to € 1,000,000.00 (the reasons were presented in section 9.5.7). Secondly, section 9.5.7 revealed that no repowering-bonus will have to be paid to WESU Repowering in mid-2014. In total, capital costs of € 20,200,206.00 are budgeted for the investment in four GE 2.5-120 wind turbines. This is € 2,441,211.33 (10.78 %) less in comparison to the investment in four E-101 / 3.0 wind turbines (€ 22,641,417.33).

Appendix W depicts the investment plan of WP Sustrum Nord and gives an overview of the project financing. A financial buffer in the form of a liquidity reserve (3.35 %) is added to the total capital costs, yielding total investment costs of € 20,900,000.00. In order to finance the investment, a limited partnership capital of € 4,800,000.00 (22.97 % of the total investment costs) will be collected. Two KfW loans of the type Erneuerbare Energien Standard will complement the financing. The same loan conditions as already introduced in section 9.5.1 are assumed (KfW, 2013). The 10-year loan amounts to € 6,000,000.00 (28.71 % of the total investment costs) and the 15-year loan to € 10,100,000.00 (48.33 %).

9.5.9. Feasibility of WP Sustrum Nord: GE 2.5

The determination of the expected annual energy production is illustrated in Appendix W. All assumptions, which have to be considered for a GE 2.5-120 wind turbine with a hub height of 139 metres in Sustrum, were pointed out in section 9.5.7 of the study, when the expected annual energy production for WESU Repowering was derived from the professional wind analysis by anemos for the wind farm Ohne. As the same assumptions are applicable for WP Sustrum Nord, the same calculation method is used. The only difference is that WP Sustrum Nord will operate four installations instead of three, which results in a higher annual revenue of € 2,809,035.69.

The annual expenses, as shown in Appendix X, are based on the same calculation method as presented in section 9.5.7 for WESU Repowering and WP Sustrum Süd. Yet, the annual operational costs are proportionately higher due to the fact that one more wind turbine is in operation.

Finally, the profit and loss forecast of WP Sustrum Nord shows a cumulative profit of € 15,695,491.44 throughout the period mid-2014 to 2034, resulting in a cumulative cash distribution of 387 %. Deducting the paid-in capital of 100 %, the annual excess yield accounts for approximately 14.35 % (= 287 % ÷ 20 years) as can be seen in Appendix Y.

9.5.10. Evaluation of the performance forecast: GE 2.5

After having analysed the financial performance and the feasibility of an investment in GE 2.5 wind turbines, it can be concluded that the limited partners of WESU Repowering (or WESU Original) will benefit less from the repowering of the original WESU fund. In comparison to the investment in E-101 wind turbines, a lower financial compensation will be generated. While the expected cash distribution of 115 % is guaranteed, the additional distribution, paid until the divestment of WESU Repowering in 2018, only amounts to 37.50 %.

In addition, the feasibility analysis of WP Sustrum Süd conveys a positive image. As indicated earlier, WnE targets a minimum cumulative cash distribution of 260 % on the paid-in limited partnership capital over a project period of 20 years. This is equivalent to an annual excess distribution of 8 % (the paid-in capital of 100 % has to be deducted to derive the excess distribution: 160 % ÷ 20 years). While an investment in E-101 wind turbines merely generates an annual excess distribution of 4.84 %, the target value of 8 % will even be exceeded with an investment in GE 2.5 installations. The forecast reveals an annual excess distribution of 14.25 % (as calculated in section 9.5.7). Consequently, the project can be realised under these conditions.

Similarly, WP Sustrum Nord will also reach the minimum target of an annual excess distribution of 8 %. As discussed in section 9.5.9, the annual excess distribution over the project period of 20 years amounts to remarkable 14.35 %. By comparison, an investment in E-101 wind turbines accounts for 5.80 %, meaning that the minimum target will not be reached with these installations.

10. Expansion of WP Ohne

As presented in section 8.2 of the thesis, the wind farm in Ohne currently comprises seven wind turbines of the type Enron Wind 1.5sl. In order to expand the wind farm in the year 2014, first the respective area has to be designated as being utilisable for wind energy. In Germany, the reservation of areas for wind energy is carried out on a national level and is laid down in the so-called spatial planning (Raumordnung). Currently, 0.37 % of the total area in Germany is reserved for wind energy projects. On a regional level (states and rural districts), regional spatial plans (Raumordnungspläne) are established on the basis of national spatial planning. More than one hundred regional spatial plans exist in Germany and they serve as a cornerstone for the designation of wind energy areas. The last step in the process is the establishment of urban land-use plans (Flächennutzungspläne) on a local level, which is carried out by the respective municipality (BMVBS, 2012). Due to the revision of the spatial planning, new areas for wind energy farms were designated in Ohne, leading to the opportunity of expanding the actual wind farm WP Ohne.

10.1. Local legal regulations

In Appendix A-2 a preliminary version of the new land-use plan for the area around the existing wind farm in Ohne is presented. As can be seen from the illustration, a minimum distance of 600 metres from a detached residential house to a potential wind turbine has to be maintained. This minimum distance is the sum of a strict prohibited zone of 400 metres and a so-called weak prohibited zone of 200 metres. Further, a minimum distance of 100 metres has to be kept from any forest. Taking into account all the afore-mentioned restrictions, the yellow-shaded area as depicted in the land-use plan remains for the expansion of the existing wind farm in Ohne. In Figure 10.1.1 the land-use plan was transformed into a map, which serves as an overview of the current project site. All seven GE 1.5sl wind turbines, which are currently in operation, are illustrated in pink, while the potential area for the wind farm expansion is illustrated in blue. Within the blue-shaded area additional installations can be constructed. Due to the size of the new wind turbines (E-101 / 3.0 or GE 2.5-120) and the required increased minimum distance to be kept between the turbines, it is assumed that no more than three additional installations can be constructed. One new installation can be deployed southerly from the wind turbine GE 1.5sl number 5 and two new installations can be deployed south-easterly and south-westerly from the wind turbine GE 1.5sl number 1.

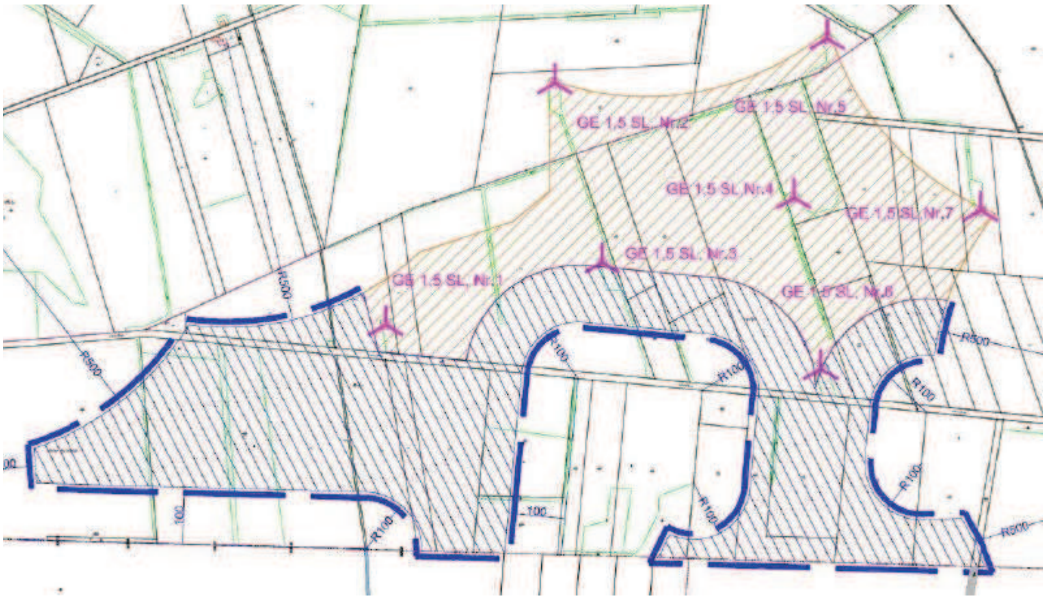


Figure 10.1.1: Map of the WP Ohne Expansion (WnE, 2013)

10.2. Wind potential in Ohne

The determination of the wind potential at the project site in Ohne was carried out by the independent consultancy for wind energy, anemos GmbH in October 2012. WnE and anemos have built a long-standing business relationship in the last years. Particularly important is the fact that anemos is known for conducting rather conservative forecasts of the energy yield.

According to their report on the wind potential from October 2012, the method of calculation is based on the wind atlas and analysis program WAsP by the RISÖ National Laboratory, Roskilde, Denmark. Information on wind data by meteorological stations was retrieved from the German Meteorological Service (DWD), while information on the topography was collected independently at the project site. It should be noted that the calculated energy yield for the different types of wind turbines was not based on the 14-year reference period defined by the IWET-index (BDB-index), as discussed in section 5.3, because the 100 % level is deemed to be inscrutable. In fact, the anemos Windatlas was used to determine the energy yield. The underlying reference period comprises the years 1992 to 2011.

Figure 10.2.1 depicts the wind speeds and energy flux densities for different heights. For the expansion of WP Ohne the wind turbines E-101 / 3.0 at a hub height of 125 metres and the GE 2.5-120 at a hub height of 110 metres are considered. Knowing that, the respective wind data can easily be derived from the figure below.

Wind Speed and Energy Flux Density

Height (m)	Wind Speed (m/s)	Energy Flux Density (W/m²)
50	4,95	144,55
60	5,21	165,42
70	5,43	184,46
80	5,60	200,19
90	5,76	215,34
100	5,90	229,26
110	6,09	252,96
120	6,26	276,01
130	6,42	298,16
140	6,57	320,33
150	6,71	341,40

Figure 10.2.1: Wind Speed and Energy Flux Density for WP Ohne (anemos, 2012)

Anemos identified that the prevailing wind direction is south-westerly to westerly. Figures 10.2.2 and 10.2.3 illustrate the distribution of the wind direction at 110 metres and 125 metres height. The relative frequencies clearly show that the wind direction at 210 degree (14.61 %) and 240 degree (18.95 %) prevails.

Distribution of the Wind Direction at 110 m Height

Wind direction (°)	Relative Frequency (%)
0	4,61
30	5,83
60	9,74
90	5,26
120	6,69
150	7,86
180	7,14
210	14,61
240	18,95
270	9,73
300	5,53
330	4,06
Total	**100,00**

Figure 10.2.2: Distribution of the Wind Direction at 110 m Height (anemos, 2012)

Distribution of the Wind Direction at 125 m Height

Wind direction (°)	Relative Frequency (%)
0	4,61
30	5,83
60	9,74
90	5,26
120	6,69
150	7,86
180	7,14
210	14,61
240	18,95
270	9,73
300	5,53
330	4,06
Total	**100,00**

Figure 10.2.3: Distribution of the Wind Direction at 125 m Height (anemos, 2012)

In Figure 10.2.4 below the final results of the wind potential as well as the analysis of the annual energy production conducted by anemos are presented. It should be noted that the analysis was initially carried out under the assumption that all existing seven wind turbines in Ohne would be dismantled and replaced by eight new installations. Further, it was assumed that eight additional installations would be built

Overview of the Final Results

Type of Wind Turbine	E-101 / 3.0	GE 2.5-120
Rated Power [MW]	3,0	2,5
Amount of Turbines - WP Ohne Expansion	3	3
Installed Rated Power - WP Ohne Expansion [MW]	9,0	7,5
Hub Height [m]	125	110
Rotor Diameter [m]	101	120
Net Annual Energy Production (after Wake Loss) [MWh]	18.987	20.372
Uncertainty Factor [%]	10,8	9,6
Probability 75 [MWh]	17.604	19.052
Full Load Hours	2.109,6	2.716,2

Figure 10.2.4: Wind Potential and Annual Energy Yield WP Ohne Expansion (anemos, 2012)

at the neighbouring municipality Wettringen, which is located across the North Rhine-Westphalian border. Together, the newly installed 16 wind turbines would have formed an entirely new wind farm. Despite the fact that the parameters of the wind energy project in Ohne have slightly changed (now an expansion rather than a replacement of the existing wind farm is intended), the underlying data, covering the wind potential in Ohne and the expected energy yield for the respective types of wind turbines, serves as an accurate basis for the forecast of the wind farm expansion project.

The final results reveal that the wind turbine GE 2.5-120 shows a better performance in terms of the expected net annual energy production after wake loss (20,372 MWh compared to 18,987 MWh), despite a hub height difference of 15 metres. Due to a larger rotor diameter, the GE turbine has a competitive advantage over the E-101 / 3.0 and is expected to generate 7.29 % more energy per year. A larger rotor diameter increases the surface area of the wind rotor, which in return leads to a higher power extraction from the available wind (as discussed in section 5.3). The positive effects of a larger rotor diameter become especially important in a relatively weak wind region such as Ohne. It should be noted that anemos calculated two different uncertainty factors for the expected net annual energy production at hub heights of 125 metres and 110 metres (10.8 % for E-101 / 3.0 and 9.6 % for GE 2.5-120). Thus, not only the annual energy yield of the GE 2.5-120 is expected to be higher, but also it is more probable that the projected energy production will be generated.

As can be seen in Figure 10.2.4, anemos provided an additional value, the exceedance probability (probability 75 or P75). This value indicates an annual energy production which is likely to be exceeded by a probability of 75 %. Likewise, anemos calculated further exceedance probabilities such as P50, P65, P90 or P95 (Anemos, 2012). It is the investor’s responsibility on which value the business plan will be based. In the case of the expansion of WP Ohne, the probability 75 will be used.

10.3. Conception of the expansion of WP Ohne

The reason why the expansion of the existing wind farm WP Ohne in the form of three additional wind turbines serves as a repowering project is specified in the EEG. As already highlighted in section 6.2, a special condition for receiving the repowering bonus (as laid down in the EEG) is met, if the repowering wind turbine is a permanent replacement for one or more existing installations in an adjoining district. The repowering project of WESU has shown that it is not always feasible to replace all existing installations in equal numbers within the same area of the former wind farm. This is due to various factors, the increase in size of state-of-the-art technology and distance constraints. The latter refers to distance regulations between installations and residential areas as well as the distance between installations in order to achieve an optimal wind farm configuration.

Despite the above-mentioned obstacles, the operator has the right to repower all dismantled installations. In the case of WESU, ten installations would be replaced by only seven repowering installations. This would lead to three unused repowering rights which could either be used to deploy three wind turbines in the same or an adjoining rural district, as specified in the EEG, or the three repowering rights could be sold to another operator. Since the rural districts Emsland and Grafschaft Bentheim, in which the wind energy funds WESU and WP Ohne are located, are neighbouring, the operating company of the WP Ohne expansion could potentially buy the three unused repowering rights of WESU in order to receive the repowering bonus for the respective remuneration period according to EEG. Of course, the operating company of the WP Ohne expansion could also buy three repowering rights from any other operator.

Additionally, the expansion of WP Ohne will have a direct impact on the existing wind farm. As can be seen in the analysis of the wind potential in Ohne, the three additional installations will be deployed in the prevailing wind direction, resulting in wake losses (Abschattungsverluste) for the seven existing wind turbines. An approval of the limited partners of the existing WP Ohne will only be obtained, if a financial compensation in the amount of the foregone energy production will be paid by the new wind energy fund.

The financial compensation will have an impact on the operational costs of the expansion project and result in an additional financial burden. Therefore, the question arises whether the expansion of WP Ohne will still be profitable and generate a lucrative yield despite this additional financial burden?

In order to determine the magnitude of the wake losses in the existing wind farm, a comparable case of a wind farm expansion will be used and will serve as a calculation basis. In the year 2011, anemos calculated the impact of an expansion of the wind farm Dörpen/Neubörger, which is operated by WnE. In Appendix B-2 the results of the calculation are summarised. It should be noted that the existing installations are not equally affected by the newly installed wind turbines, but rather impacted to a smaller or to a larger extent, depending on the position of the new installations. If a new installation is deployed in the prevailing wind direction and directly in front of an existing installation, the wake loss for the respective wind turbine will be more considerable than for the other wind turbines in the wind farm. In the comparable example case, the maximum wake losses amount to approximately 6 to 12 %, while the minimum wake losses amount to approximately 0.06 to 5 %.

Considering these results, a wake loss of 8 % will be taken into account for the financial compensation of WP Ohne. This value seems to be reasonable since the three additional wind turbines will be built in the prevailing wind direction (in case of a south-westerly wind), but will not be deployed directly in front of the existing installations. Therefore, the maximum value of 12 % is considered to be too high.

10.4. New investments E-101 / 3.0 and GE 2.5-120

In order to assess the feasibility of the expansion of WP Ohne in mid-2014, the investment costs of the project have to be determined. As the analysis will be based on two different types of wind turbines (Enercon and GE), both investments and the respective feasibility studies will be presented separately. At first, the investment in the type E-101 / 3.0 will be evaluated followed by the investment in the type GE 2.5-120.

10.4.1. Financial analysis: E-101

The first cornerstone of the financial analysis is the determination of the total capital costs. In Appendix C-2 the different cost positions to be considered are listed. Except for the offering price of the wind turbine, which is based on the official offer by Enercon, and the costs for buying three repowering rights in order to be entitled to the repowering-bonus, all cost positions are based on reasonable estimations. These include the costs for compensation measures, project development, interest payments until start-up, connection to the grid, infrastructure, right of special use, supervision until start-up and miscellaneous. It should be noted that the estimations are again deduced from the cost structure of past wind farm projects of WnE and are verified by Jürgen Coßmann, the project controller of WnE. Furthermore, it is expected that no additional transformer station (Umspannwerk) for the expansion of the wind farm has to be installed, rather the existing one in Schüttorf will be used. The feasibility of this connection is currently under investigation, but not yet confirmed by the grid operator RWE (WnE, 2013). Moreover, the RWE Netzservice

GmbH confirmed that the additional electricity feed-in due to the expansion of the wind farm can be transmitted via the existing 240 kV transmission line, leading to a considerable capital cost reduction (the email correspondence can be found in Appendix D-2).

Appendix E-2 illustrates the calculation method behind the cost position repowering rights (Repowering-Ansprüche). In section 10.3 of the study it was already discussed that three unused repowering rights will be bought from another operator (in this case from WESU Repowering) in order to be entitled to the repowering-bonus. Both, the seller of the repowering rights (WESU Repowering) and the buyer (the operator of the expansion of WP Ohne) want to receive an economic compensation. Thus, the generated income in the form of the repowering-bonus will be equally divided. The repowering-bonus in the year 2014 amounts to 0.49 ct/kWh (as shown in section 6.1) and will be paid for a period of twenty years. Multiplying this value by the forecasted annual energy production per wind turbine (derived from the wind potential analysis by anemos as presented in section 10.2), gives the annual repowering-bonus in the amount of € 25,895.00. Considering the twenty-year remuneration period, the total value amounts to € 517,894.00. One half of the repowering-bonus has to be paid out in the form of a one-time payment at the beginning of the project's lifetime in mid-2014 in order to fulfil the 50 % share of WESU in the repowering rights. Consequently, the mathematically correct value of the repowering-bonus has to be derived by calculating the net present value. Again, a discount rate of 5.07 % (as from 31 March 2013) is applied for a period of twenty years (DBB, 2013). Appendix E-2 illustrates the application of the net present value calculation in detail. The results show that the total value of the repowering-bonus decreases from initially € 517,894.00 to € 320,897.00, of which one half (€ 160,448.00) will be paid to WESU in mid-2014. This compensation payment has to be taken into account for the total capital costs of the project by multiplying it by the actual number of additional wind turbines, in this case by three.

Taking into account all aforementioned cost positions, the total capital costs amount to € 14,578,409.94. Once again, a financial buffer in the form of a liquidity reserve of about 2 to 4 % has to be added, resulting in total investment costs of € 15,000,000.00. The investment plan, which is presented in Appendix F-2, gives an overview of the project financing. As can be seen in the investment plan, € 3,500,000.00 (23.33 % of the total investment costs) will be collected from the limited partners. The remaining part will again be financed by two KfW loans of the type Erneuerbare Energien Standard (KfW, 2013). The first loan will have to be paid back after 10 years and the second after 15 years. The KfW grants a grace period of 2 and 3 years, respectively (KfW, 2013). As the average payback period of both loans should not exceed 13.5 years (WnE, 2013), € 3,200,000.00 (21.33 % of the total investment costs) will be paid back within a period of 10 years and € 8,300,000.00 (55.33 %) after 15 years. In addition, the same assumptions with regard to the loan conditions apply as discussed in section 9.5.1.

10.4.2. Feasibility analysis: E-101

Figure 10.2.4 reveals that the expected annual energy production of the three additional wind turbines amounts to 17,604 MWh. However, deductions for the technical availability of the wind turbine (3 %), for transmission losses (2 %) and for a safety margin (5 %) have to be included in order to calculate the expected annual energy production. The resulting value is multiplied by the sum of the initial tariff (8.66 ct/kWh in 2014) and the repowering-bonus (0.49 ct/kWh in 2014), so that an annual revenue of € 1,450,632.68 will be generated. The detailed calculations are presented in Appendix F-2.

Appendix G-2 depicts the operational costs such as insurance costs, electricity self-demand, maintenance costs or miscellaneous which are deduced from the cost structure of former wind farm projects of WnE and are revised by the project controller, Jürgen Coßmann. An annual cost increase due to an inflation rate of 3 % is expected.

One peculiarity of the expansion project is the required financial compensation for the existing wind farm in Ohne, as already discussed in detail in section 10.3. A wake loss of 8 % has to be taken into account. In order to calculate the financial value of the compensation, the annual production of the seven existing installations has to be analysed. In Figure 9.2.1 the annual energy yields of the years 2005 to 2012 are listed. On average, the seven existing wind turbines generated 19,152,176 kWh. Since a decrease of 8 % of the annual energy production is expected, the required financial compensation can easily be derived by multiplying the average energy production by the expected wake loss of 8 % and by the feed-in tariff of 9.1 ct/kWh, which is valid for the existing WP Ohne. Consequently, a total annual amount of € 139,428.00 has to be paid to the existing wind farm until the end of its project lifetime (ending in the year 2021).

Another important aspect of the operational costs is the lease payment. According to the lease contract of WP Ohne, a lease rate of 4 % of the electricity revenue is paid in the first ten years. As from the eleventh year, the rate increases to 5 %. Additionally, € 0.25 per m² is paid for a maximum sealed area of 4,000 m² (WnE, 2013). On average, the forecast accounts for an annual extra amount of € 750.00 per wind turbine.

Besides the required financial compensation and the lease payments, maintenance makes up a large part of the operational costs. The conditions of the Enercon-Partner-Konzept are specified in Appendix G-2 and are based on an offer from 13 July 2012. It should be noted that the maintenance contract will only be valid for 15 years. After this period a significant increase in maintenance costs is expected due to the aging of the wind turbines and the associated increased risk of damage. Therefore, the forecast includes a 50 % increase of maintenance costs as from the year 2029.

Finally, the annual profit and loss forecast of the new wind energy fund shows a devastating picture. From the year 2014 to 2029 (except for the year 2028), the fund will exclusively generate financial losses. Profits will only be generated in the last five years from 2030 to 2034. As depicted in Appendix G-2 the weak performance will result in a maximum cash distribution of 144.50 % (cumulative over the 20-year project period) on the paid-in limited partnership capital. Deducting the paid-in capital of 100 %, the annual yield accounts for approximately 2 % (= 44.50 % ÷ 20 years) as can be seen in Appendix H-2.

10.4.3. Financial analysis: GE 2.5

Similar to the investment in the wind turbine E-101 / 3.0, the financial analysis of the investment in GE 2.5-120 begins with the determination of the total capital costs. The cost positions in Appendix I-2 are identical with the costs used for the investment in the Enercon wind turbine. Only two differences have to be considered when comparing the two investments. Firstly, the offering price for a GE 2.5-120 turbine is considerably lower than for the turbine E-101 / 3.0 (Appendix I-2) and secondly, the total value of the repowering-bonus (€ 560,515.00) is higher compared to the repowering-bonus generated by an Enercon wind turbine (€ 517,894.00). The reason is the better performance of the GE 2.5-120 in terms of the annual energy production (derived from the wind potential analysis by anemos as presented in section 10.2). Accordingly, the net present value of the repowering-bonus generated by GE (€ 347,305.00) is also higher than the one generated by Enercon (€ 320,897.00) (Appendix J-2). It should be noted that the same calculation method (as applied in section 10.4.1) is used to derive the net present value. As discussed earlier in this study, one half of the repowering-bonus (net present value) has to be paid out in the form of a one-time payment at the beginning of the project lifetime in mid-2014 in order to fulfil the 50 % share of the seller.

Taking into account all aforementioned cost positions, the total capital costs amount to € 12,185,958.01. Again, a financial buffer in the form of a liquidity reserve of about 2 to 4 % has to be added, resulting in total investment costs of € 12,600,000.00. In total, € 3,000,000.00 (23.81 % of the total investment costs) will be collected as limited partnership capital. The remaining part of the investment costs will be financed by two KfW loans including two different payback periods. The financing conditions are identical to the ones on which the project financing of the investment in Enercon turbines was based (KfW, 2013). In Appendix K-2 an overview of the financing structure is shown. It reveals that € 3,600,000.00 (28.57 % of the total investment costs) will be paid back within a period of 10 years and € 6,000,000.00 (47.62 %) after 15 years.

10.4.4. Feasibility analysis: GE 2.5

Figure 10.2.4 depicts that the expected annual energy production of the three additional wind turbines amounts to 19,052 MWh. Again, deductions for the technical availability of the wind turbine (3 %), for transmission losses (2 %) and for a safety margin (5 %) have to be included in order to calculate the expected annual energy production. The resulting value is multiplied by the sum of the initial tariff (8.66 ct/kWh in 2014) and the repowering-bonus (0.49 ct/kWh in 2014), so that an annual revenue of € 1,570,014.41 will be generated. Due to the higher expected annual energy production of the GE 2.5-120 compared to E-101 / 3.0, the annual revenue will be higher accordingly. In Appendix K-2 the detailed calculations are presented.

The forecast, as shown in Appendix L-2, is based on the same calculation method as presented in section 10.4.2. Likewise, the financial compensation for the existing wind farm in Ohne in the amount of € 139,428.00 will be paid until 2021. In contrast to the forecast of E-101 / 3.0, the annual lease payments will increase. This is due to the fact that the lease payments are depended on the annual energy production. Since the annual production of the GE 2.5-120 is considerably higher compared to the E-101 / 3.0, an annual increase of the lease payments in the amount of € 4,776.00 is considered in the profit and loss forecast.

Another difference can be identified in the amount of maintenance costs. GE offers a different cost structure for the maintenance service than Enercon. The conditions of the Vollabsicherungs-Konzept by GE are specified in Appendix L-2 and are based on an offer from 13 February 2013. Similar to the Enercon offer, the maintenance contract will only be valid for 15 years. After this period a significant increase in the maintenance costs is expected due to the aging of the wind turbines and the associated increased risk of damage. Therefore, the forecast includes a 50 % increase of the maintenance costs as from the year 2029.

In contrast to the profit and loss forecast of an investment in E-101 / 3.0 installations, the forecast of the investment in three GE 2.5-120 wind turbines shows a positive trend. Except for the first year, the wind energy fund will generate annual profits throughout the entire project lifetime, accumulating to € 5,171,943.00. As depicted in Appendix L-2, the financial performance will result in a maximum cash distribution of 251.00 % (cumulative over the 20-year project period) on the paid-in limited partnership capital. Deducting the paid-in capital of 100 %, the annual yield is 7.55 % (= 151.00 % ÷ 20 years) as can be verified in Appendix M-2.

10.4.5. Evaluation of the performance forecasts

Considering the results of both financial and feasibility analyses it can be concluded that an investment in GE wind turbines is more economically feasible for a potential expansion of WP Ohne than an investment in Enercon wind turbines.

As a matter of fact, the expansion of WP Ohne cannot be realised if the wind energy fund invests in E-101 turbines. Neither would a financing bank accept this project under the above-mentioned conditions, nor would a limited partner be willing to invest in this fund. Besides the external obstacles, WnE itself targets a minimum cumulative cash distribution of 260 % on the paid-in limited partnership capital over the project period of 20 years. As seen earlier, an investment in E-101 turbines will not meet this condition and will only distribute 144.50 %. In comparison, an investment in GE generates a cumulative cash distribution of 251.00 % throughout the project period of 20 years, but falls short of WnE’s return requirement as well.

An analysis of the selling prices reveals that the investment costs per kWh account for € 0.95 in the case of E-101 / 3.0, while it only accounts for € 0.73 in the case of

GE 2.5-120 (the detailed calculations can be seen in Appendix H-2 and Appendix M-2, respectively). Enercon would have to reduce the selling price per E-101 / 3.0 by remarkable 21.61 % in order to reach a cumulative distribution of 260 %. Consequently, the maximum acceptable investment costs per kWh for an E-101 turbine would amount to € 0.78. GE would have to reduce the selling price per GE 2.5-120 by only 1.65 % to reach the goal of 260 % cumulative cash distribution. The investment costs per kWh would have to be reduced from € 0.73 to € 0.72.

11. Conclusion, Outlook and Recommendation

Conclusion

After having analysed the current status of the legal framework EEG and the associated repowering incentives (especially in the form of the repowering-bonus), the conclusion can be drawn, that repowering projects in northern Germany are basically economically feasible. In combination with the higher initial tariff, paid for a maximum period of twenty years (as discussed in section 6.1 and 6.2), the EEG under the current legal arrangement, provides planning security and therefore promotes repowering decisions.

Yet, the case studies on the repowering of WESU and the expansion of the wind farm in Ohne reveal that the feasibility of a repowering project strongly depends on the choice of the type of wind turbine. Further, the general set-up of the underlying wind energy fund and the extent to which a potential repowering negatively affects the existing wind energy project economically are crucial factors. Both case studies demonstrate that a repowering decision inevitably impacts the rights of the existing limited partners and changes the original conception of the wind energy funds.

In the case of WESU (as highlighted in sections 9 to 9.5.10), compensation payments for foregone distributions result in additional annual cash distributions for the repowering project WESU Repowering in the period mid-2014 to 2018 (cumulative € 5,590,286.48) and for increasing total capital costs for the repowering project WP Sustrum Nord in mid-2014 (€ 1,265,205.60). As a consequence, the profitability of the acquiring fund of WESU Repowering, WP Sustrum Süd, as well as the profitability of the new wind energy fund, WP Sustrum Nord, is negatively affected. Figure 11.1 below summarises the research findings. The research reveals that the attainment of WnE’s minimum target for new wind energy funds, an annual excess cash distribution on the limited partnership capital of 8 %, strongly depends on the efficiency and on the selling price of the wind turbine type. The feasibility analysis of an investment in E-101 / 3.0 installations shows a devastating outcome for Enercon. Both, WP Sustrum Süd (4.84 % annual excess distribution) and WP Sustrum Nord, (5.80 % annual excess distribution) fall short of the minimum target by far, despite the fact that the projects are entitled to the repowering-bonus of 0.49 ct/kWh. Consequently, a significant price reduction by 10.95 % and 9.55 %, respectively, is necessary to meet the required values of the ratio investment costs per kWh and to guarantee the feasibility of the repowering projects in Sustrum.

Final Results of the Feasibility Studies

Wind Energy Fund / Type of WT	WESU Repowering		WP Sustrum Süd		WP Sustrum Nord		WP Ohne Expansion	
	E-101 / 3.0	GE 2.5-120	E-101 / 3.0	GE 2.5-120	E-101 / 3.0	GE 2.5-120	E-101 / 3.0	GE 2.5-120
	mid-2014 to 2018		2019 to 2034		mid-2014 to 2034		mid-2014 to 2034	
Intital Tariff [in ct/kWh]	8,66	8,66	8,66	8,66	8,66	8,66	8,66	8,66
Repowering-Bonus [in ct/kWh]	0,49	-	0,49	-	0,49	-	0,49	0,49
Total Investment Costs [in €]	14.545.000	13.465.000	14.545.000	13.465.000	22.641.417	20.200.206	14.578.410	12.185.958
Investment Costs / kWh [in €]	0,73	0,55	0,73	0,55	0,88	0,64	0,95	0,73
required	-	-	0,67	-	0,82	-	0,78	0,72
Annual Energy Production [in kWh]	19.791.931	24.327.676	19.791.931	24.327.676	26.389.242	32.436.902	15.853.909	17.158.627
Owner's Equity (OE) [in €]	6.281.221	6.281.221	3.200.000	3.000.000	5.400.000	4.800.000	3.500.000	3.000.000
Cumulative Profit [in €]	7.159.175	6.409.646	4.534.415	9.238.209	7.284.019	15.695.491	1.891.143	5.171.943
Cum. Distribution [in % to OE]	89,00	89,00	177,50	328,00	216,00	387,00	144,50	251,00
targeted	89,00	89,00	228,00	228,00	260,00	260,00	260,00	260,00
Cum. Excess Distribution [in % to OE]	51,00	37,50	-	-	-	-	-	-
Annualised Excess Distribution [in % to OE]	-	-	4,84	14,25	5,80	14,35	2,23	7,55
targeted	-	-	8,00	8,00	8,00	8,00	8,00	8,00

Figure 11.1: Final Results of the Feasibility Studies

On the contrary, a lower selling price of GE 2.5-120 and higher annual energy yields lead to remarkably high average rates of return. Both, the limited partners of WP Sustrum Süd and WP Sustrum Nord can benefit from exceptionally high annual excess cash distributions accounting for 14.25 % and 14.35 %, respectively. Remarkably enough, the increased efficiency of the GE wind turbine generates higher yields even without the additional repowering-bonus.

The case study on the wind farm in Ohne (as highlighted in sections 10 to 10.4.5) shows a similar pattern. In this particular project, the expansion has a direct impact on the existing seven wind turbines by increasing the wake losses in the wind farm. As a result, a financial compensation in the amount of the foregone energy production will have to be paid by the new wind energy fund to the existing limited partners, leading to an increase in the operational costs. According to the analysis, an annual wake loss of 8 % is expected, resulting in an annual compensation payment of € 139,428.00 until 2021. A higher selling price for E-101 / 3.0 wind turbines in comparison to GE 2.5-120 in combination with low annual energy yields at the weak-wind location Ohne, leads to the fact that the expansion project cannot be realised with Enercon installations. While the maximum annual excess cash distribution accounts for no more than 2.23 % for Enercon, GE generates an adequate annual excess distribution of 7.55 %. Although both investments fall short of the desired minimum target of 8 %, the project realisation with GE seems possible. A reasonable selling price reduction of 1.65 %, resulting in a decrease of the investment costs per kWh from € 0.73 to € 0.72, would already be sufficient to attain the target. In contrast, Enercon would have to reduce the selling price by remarkable 21.61 %.

Outlook

The results of the economic feasibility study emphasise the crucial importance of the repowering incentives with respect to the realisation of repowering projects in northern Germany. Especially in weak-wind regions such as Ohne, the feasibility of repowering projects could barely be guaranteed without the higher initial tariff (8.66 ct/kWh in 2014) and the repowering-bonus (0.49 ct/kWh in 2014). Considering the intended EEG amendments, as announced by the Federal Minister of Economy and the Federal Minister of the Environment in mid-February 2013 (as discussed in section 6.3), it can be inferred that a successful implementation of repowering projects will further be complicated. According to their common position, the higher initial tariff would be decreased to 8 ct/kWh and the repowering-bonus would be cancelled completely. In addition, the remuneration for the first five months from the date of start-up would be reduced to the spot price of electricity. Basing the feasibility studies on these amendments would result in substantially weaker financial performances of the projects in Sustrum and Ohne. Even an investment in the more efficient GE 2.5-120 wind turbine would not guarantee a sufficient feasibility. To exemplify, the annual excess cash distribution for the expansion in Ohne would be reduced from 7.55 % to 1.15 % and could therefore not be implemented under the given conditions. In the case of the repowering projects WP Sustrum Süd and WP Sustrum Nord, the annual excess cash distribution would decrease from 14.25 % to 11.88 % and from 14.35 % to 9.25 %. The results show that both repowering projects at the project site Sustrum, which is a stronger wind location compared to Ohne, could still be realised even under worse economic conditions. Thus, it can be concluded that the feasibility of future repowering projects in northern Germany (under the assumption that the aforementioned amendments will enter into force) will even stronger depend on the wind conditions at the project site. Further, the framework conditions of the underlying wind energy fund will be a decisive factor. As illustrated in both case studies, required compensation payments can lead to overextending financial burdens and prevent the realisation of the repowering project.

Recommendation

Due to ongoing political disputes over potential EEG amendments after the German parliamentary election in September 2013, investment security for repowering projects starting up in 2014 is not fulfilled. Both case studies, which are planned for mid-2014, are based on the actual EEG amendment 2012. Since potential amendments will have a direct impact on the feasibility of the repowering projects, it is recommended to await the outcome of the political discussions before the final repowering decision is made.

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13. List of Figures

14. Appendices

Appendix A

1) Profitability Outlook WESU Original: Worst-case scenario

Szenario für WESU	Referenz *1	12	13	14	15	16	17	18	19	20		Mitte 2014 - 2020
"Worst-Case"	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	**kum.**	**kum.**
Stromerlöse	2.193.784	2.017.305	2.017.305	2.017.305	2.017.305	2.017.305	2.017.305	2.017.305	2.017.305	2.017.305	18.155.745	13.112.483
Zinserträge	13.673	9.313	9.305	15.247	19.801	19.162	13.683	7.597	830	858	95.796	69.553
Erlöse aus Direktvermarktung *2		141.876	116.826	93.106	70.273						422.082	116.826
Ertragsausfallzahlungen	3.765										0	0
Erträge gesamt	**2.211.222**	**2.168.494**	**2.143.437**	**2.125.659**	**2.107.379**	**2.036.467**	**2.030.988**	**2.024.902**	**2.018.135**	**2.018.163**	**18.673.623**	**13.298.862**
Aufwendungen												
Partnerschaftsvereinbarung/Reparaturen *3	331.200	341.136	351.370	361.911	555.955	750.000	772.500	795.675	819.545	844.132	5.592.224	4.718.762
Bonus		25.000	25.000	25.000	25.000	25.000	25.000	25.000	25.000	25.000	225.000	162.500
Pachtaufwendungen	135.705	126.038	126.038	166.384	166.384	166.384	166.384	166.384	166.384	166.384	1.416.767	1.081.499
Verwaltung / Funktionsüberw.	123.733	127.445	131.268	135.206	139.262	143.440	147.743	152.176	156.741	161.443	1.294.723	968.408
Technische Betreuung WEA u. Pherepherie	19.895	20.492	21.107	21.740	22.392	23.064	23.756	24.469	25.203	25.959	208.181	155.712
Versicherungen	51.525	53.071	54.663	56.303	57.992	59.732	61.524	63.370	65.271	67.229	539.155	403.269
Komplementärvergütung	4.030	4.232	4.443	4.666	4.899	5.144	5.401	5.671	5.955	6.252	46.662	35.654
Steuerberatung, Jahresabschluss	5.960	6.139	6.323	6.513	6.708	6.909	7.117	7.330	7.550	7.776	62.365	46.647
Rückbauverpflichtung	14.485	14.485	14.485	14.485	14.485	14.485	14.485	14.485	14.485	14.485	130.365	94.153
Abschreibungen	50.133	45.924	45.924	45.924	45.924	45.924	45.924	22.953			298.497	183.687
Eigenstromverbrauch	14.347	14.777	15.220	15.677	16.147	16.632	17.131	17.645	18.174	18.719	150.123	112.286
Sonstiges	10.381	10.692	11.013	11.343	11.684	12.034	12.395	12.767	13.150	13.544	108.622	81.246
Zinsaufwand	23.513	7.044									7.044	0
Disagio	11.419	12.802									12.802	0
Aufwendungen vor Gewerbesteuer	796.325	809.277	806.855	865.152	1.066.833	1.268.748	1.299.360	1.307.924	1.317.457	1.350.924	10.092.530	8.043.822
Gewerbesteuer	173.995	149.488	146.953	138.433	113.797	83.241	79.198	77.558	77.558	77.558	943.783	578.125
Aufwendungen gesamt	970.320	958.765	953.808	1.003.585	1.180.630	1.351.989	1.378.558	1.385.481	1.395.015	1.428.482	11.036.313	8.621.947
Partnerschaftsvereinbarung (Bonuskompensation)	4.901										0	0
Jahresüberschuss vor WEA Dörpen	1.245.803	1.209.729	1.189.629	1.122.074	926.749	684.479	652.430	639.420	623.120	589.681	7.637.310	4.676.915
Steuerlicher Ergebnisanteil WEA Dörpen	168.361	85.000	85.000	85.000	85.000	85.000	85.000	85.000	85.000	85.000	765.000	552.500
Ergebnis kumuliert	1.414.164	1.294.729	1.274.629	1.207.074	1.011.749	769.479	737.430	724.420	708.120	674.681	8.402.310	5.229.415
Liquiditätsprognose												
Jahresüberschuss vor WEA Dörpen	1.245.803	1.209.729	1.189.629	1.122.074	926.749	684.479	652.430	639.420	623.120	589.681	7.637.310	4.676.915
zzgl. Zuführung Rückst. Rückbau	14.485	14.485	14.485	14.485	14.485	14.485	14.485	14.485	14.485	14.485	130.365	94.153
zzgl. Abschreibungen	50.133	45.924	45.924	45.924	45.924	45.924	45.924	22.953	0	0	298.497	183.687
zzgl. Abschreibung Disagio	11.419	12.802								0	12.802	0
abzgl. einbehaltene Zinsabschlagssteuer	-3.596	-2.947	-2.945	-4.826	-6.267	-6.065	-4.330	-2.404	-263	-271	-30.318	-22.013
abzgl. Tilgung	-329.272	-330.377									-330.377	0
Barausschüttung	**-1.130.620**	**-1.004.995**	**-1.004.995**	**-1.004.995**	**-1.067.808**	**-1.067.808**	**-1.067.808**	**-1.067.808**	**-690.934**	**-690.934**	**-8.668.085**	**-6.155.596**
Barausschüttung in Prozent	**18,00%**	**16,00%**	**16,00%**	**16,00%**	**17,00%**	**17,00%**	**17,00%**	**17,00%**	**11,00%**	**11,00%**	**138,00%**	**98,00%**
Liquiditätsüberschuss	-141.648	-55.380	242.097	172.662	-86.916	-328.985	-359.299	-393.353	-53.592	-87.040	-949.806	-1.222.855
Liquiditätsreserve am Jahresanfang	484.103	465.654	465.274	762.372	990.034	958.117	684.133	379.833	41.480	42.888	4.789.784	3.477.669
Liquiditätsüberschuss WEA Dörpen	153.199	85.000	85.000	85.000	85.000	85.000	85.000	85.000	85.000	85.000	765.000	552.500
Liquiditätsreserve	495.654	550.654	550.274	847.372	1.075.034	1.043.117	769.133	464.833	126.480	127.888	5.554.784	4.030.169
abzgl. Liquiditätszuführung Rückbaukonto	-30.000	-30.000	-30.000	-30.000	-30.000	-30.000	-30.000	-30.000	-30.000	-30.000	-270.000	-195.000
Liquiditätsreserve am Jahresende	**465.654**	**465.274**	**762.372**	**990.034**	**958.117**	**684.133**	**379.833**	**41.480**	**42.888**	**10.848**	**4.334.978**	**2.612.315**

*1 Das Referenzjahr 2011 gilt als angemessenes Basiswindjahr mit ca. 82 % der Stromerlöse im Vergleich zur Planrechnung

*2 Zusätzliche Zahlungen an WESU über den EEG-Vergütungspreis (2012 - 0,640 Cent/kWh; 2013 - 0,527 Cent/kWh; 2014 - 0,420 Cent/kWh; 2015 - 0,317 Cent/kWh)

*3 Aus Vereinfachungsgründen wurden nach dem Auslaufen der Partnerschaftsvereinbarung 75.000 € pro WEA (1.5i) angenommen. Weiterhin wurde zugrunde gelegt, dass Bonuszahlungen in Höhe von 25.000 € an GE fällig werden.

Berechnung der GewSt			2012	2013	2014	2015	2016	2017	2018	2019	2020	
Verlustvortrag Ende 2011: **0**												
Ergebnis vor Steuer			1.359.218	1.336.582	1.260.507	1.040.546	767.719	731.628	716.978	700.677	667.239	8.581.093
Darlehenszinsen / Disagio	*100%*		*19.846*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	
Pachten	*50%*		*63.019*	*63.019*	*83.192*	*83.192*	*83.192*	*83.192*	*83.192*	*83.192*	*83.192*	
Zwischensumme			*82.865*	*63.019*	*83.192*	*83.192*	*83.192*	*83.192*	*83.192*	*83.192*	*83.192*	
abzüglich Freibetrag 100.000 €			*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	
Hinzurechnung	25%		0	0	0	0	0	0	0	0	0	
gewst. Ergebnis			1.359.218	1.336.582	1.260.507	1.040.546	767.719	731.628	716.978	700.677	667.239	
./. Freibetrag (24.500)			-24.500	-24.500	-24.500	-24.500	-24.500	-24.500	-24.500	-24.500	-24.500	
zu versteuerndes Ergebnis			**1.334.718**	**1.312.082**	**1.236.007**	**1.016.046**	**743.219**	**707.128**	**692.478**	**676.177**	**642.739**	**8.360.593**
Hebesatz	320%											
Gewerbesteuer Messbetrag	3,5%		46.715	45.923	43.260	35.562	26.013	24.749	24.237	24.237	24.237	
Gewerbeertragsteuer gesamt			**149.488**	**146.953**	**138.433**	**113.797**	**83.241**	**79.198**	**77.558**	**77.558**	**77.558**	**943.783**

2) Profitability Outlook WESU Original: Average-case scenario

Szenario für WESU "Average-Case"	Referenz *1 2011	12 2012	13 2013	14 2014	15 2015	16 2016	17 2017	18 2018	19 2019	20 2020	kum.	Mitte 2014 - 2020 kum.
Stromerlöse	2.193.784	2.193.784	2.193.784	2.193.784	2.193.784	2.193.784	2.193.784	2.193.784	2.193.784	2.193.784	19.744.053	14.259.594
Zinserträge	13.673	9.504	10.344	17.104	22.385	21.191	15.040	8.275	822	1.410	106.073	77.674
Erlöse aus Direktvermarktung *2		154.288	127.047	101.252	76.421						459.007	127.047
Ertragsausfallzahlungen	3.765										0	0
Erträge gesamt	**2.211.222**	**2.357.576**	**2.331.174**	**2.312.139**	**2.292.589**	**2.214.974**	**2.208.824**	**2.202.059**	**2.194.605**	**2.195.194**	**20.309.134**	**14.464.314**
Aufwendungen												
Partnerschaftsvereinbarung/Reparaturen *3	331.200	341.136	351.370	361.911	555.955	750.000	772.500	795.675	819.545	844.132	5.592.224	4.718.762
Bonus		25.000	25.000	25.000	25.000	25.000	25.000	25.000	25.000	25.000	225.000	162.500
Pachtaufwendungen	135.705	136.627	136.627	180.503	180.503	180.503	180.503	180.503	180.503	180.503	1.536.773	1.173.268
Verwaltung / Funktionsüberw.	123.733	127.445	131.268	135.206	139.262	143.440	147.743	152.176	156.741	161.443	1.294.723	968.408
Technische Betreuung WEA u. Pherepherie	19.895	20.492	21.107	21.740	22.392	23.064	23.756	24.469	25.203	25.959	208.181	155.712
Versicherungen	51.525	53.071	54.663	56.303	57.992	59.732	61.524	63.370	65.271	67.229	539.155	403.269
Komplementärvergütung	4.030	4.232	4.443	4.666	4.899	5.144	5.401	5.671	5.955	6.252	46.662	35.654
Steuerberatung, Jahresabschluss	5.960	6.139	6.323	6.513	6.708	6.909	7.117	7.330	7.550	7.776	62.365	46.647
Rückbauverpflichtung	14.485	14.485	14.485	14.485	14.485	14.485	14.485	14.485	14.485	14.485	130.365	94.153
Abschreibungen	50.133	45.924	45.924	45.924	45.924	45.924	45.924	22.953			298.497	183.687
Eigenstromverbrauch	14.347	14.777	15.220	15.677	16.147	16.632	17.131	17.645	18.174	18.719	150.123	112.286
Sonstiges	10.381	10.692	11.013	11.343	11.684	12.034	12.395	12.767	13.150	13.544	108.622	81.246
Zinsaufwand	23.513	7.044									7.044	0
Disagio	11.419	12.802									12.802	0
Aufwendungen vor Gewerbesteuer	796.325	819.866	817.444	879.271	1.080.951	1.282.867	1.313.478	1.322.042	1.331.576	1.365.042	10.212.536	8.135.591
Gewerbesteuer	173.995	169.480	166.794	157.737	132.959	101.652	97.535	95.818	95.818	95.818	1.113.610	698.468
Aufwendungen gesamt	970.320	989.345	984.238	1.037.008	1.213.911	1.384.519	1.411.013	1.417.860	1.427.393	1.460.860	11.326.146	8.834.060
Partnerschaftsvereinbarung (Bonuskompensation)	4.901										0	0
Jahresüberschuss vor WEA Dörpen	1.245.803	1.368.231	1.346.936	1.275.131	1.078.679	830.456	797.811	784.199	767.212	734.334	8.982.988	5.630.255
Steuerlicher Ergebnisanteil WEA Dörpen	168.361	85.000	85.000	85.000	85.000	85.000	85.000	85.000	85.000	85.000	765.000	552.500
Ergebnis kumuliert	1.414.164	1.453.231	1.431.936	1.360.131	1.163.679	915.456	882.811	869.199	852.212	819.334	9.747.988	6.182.755
Liquiditätsprognose												
Jahresüberschuss vor WEA Dörpen	1.245.803	1.368.231	1.346.936	1.275.131	1.078.679	830.456	797.811	784.199	767.212	734.334	8.982.988	5.630.255
zzgl. Zuführung Rückst. Rückbau	14.485	14.485	14.485	14.485	14.485	14.485	14.485	14.485	14.485	14.485	130.365	94.153
zzgl. Abschreibungen	50.133	45.924	45.924	45.924	45.924	45.924	45.924	22.953	0	0	298.497	183.687
zzgl. Abschreibung Disagio	11.419	12.802									12.802	0
abzgl. einbehaltene Zinsabschlagssteuer	-3.596	-3.008	-3.274	-5.413	-7.085	-6.707	-4.760	-2.619	-260	-446	-33.571	-24.583
abzgl. Tilgung	-329.272	-330.377									-330.377	0
Barausschüttung	**-1.130.620**	**-1.130.620**	**-1.130.620**	**-1.130.620**	**-1.256.244**	**-1.256.244**	**-1.256.244**	**-1.256.244**	**-816.559**	**-816.559**	**-10.049.953**	**-7.223.404**
Barausschüttung in Prozent	**18,00%**	**18,00%**	**18,00%**	**18,00%**	**20,00%**	**20,00%**	**20,00%**	**20,00%**	**13,00%**	**13,00%**	**160,00%**	**115,00%**
Liquiditätsüberschuss	-141.648	-22.563	273.452	199.507	-124.241	-372.086	-402.784	-437.226	-35.122	-68.186	-989.250	-1.339.892
Liquiditätsreserve am Jahresanfang	484.103	475.199	517.182	855.179	1.119.232	1.059.537	751.996	413.757	41.076	70.500	5.303.658	3.883.687
Liquiditätsüberschuss WEA Dörpen	153.199	85.000	85.000	85.000	85.000	85.000	85.000	85.000	85.000	85.000	765.000	552.500
Liquiditätsreserve	495.654	560.199	602.182	940.179	1.204.232	1.144.537	836.996	498.757	126.076	155.500	6.068.658	4.436.187
abzgl. Liquiditätszuführung Rückbaukonto	-20.455	-20.455	-20.455	-20.455	-20.455	-20.455	-20.455	-20.455	-20.455	-20.455	-184.091	-132.955
Liquiditätsreserve am Jahresende	**475.199**	**517.182**	**855.179**	**1.119.232**	**1.059.537**	**751.996**	**413.757**	**41.076**	**70.500**	**66.859**	**4.895.318**	**2.963.340**

*1 Das Referenzjahr 2011 gilt als angemessenes Basiswindjahr mit ca. 82 % der Stromerlöse im Vergleich zur Planrechnung

*2 Zusätzliche Zahlungen an WESU über den EEG-Vergütungspreis (2012 - 0,640 Cent/kWh; 2013 - 0,527 Cent/kWh; 2014 - 0,420 Cent/kWh; 2015 - 0,317 Cent/kWh)

*3 Aus Vereinfachungsgründen wurden nach dem Auslaufen der Partnerschaftsvereinbarung 75.000 € pro WEA (1.5i) angenommen. Weiterhin wurde zugrunde gelegt, dass Bonuszahlungen in Höhe von 25.000 € an GE fällig werden.

Berechnung der GewSt		2012	2013	2014	2015	2016	2017	2018	2019	2020	
Verlustvortrag Ende 2011: **0**											
Ergebnis vor Steuer		1.537.710	1.513.730	1.432.868	1.211.638	932.108	895.346	880.017	863.030	830.151	10.096.598
Darlehenszinsen / Disagio	100%	*19.846*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	
Pachten	50%	*68.314*	*68.314*	*90.251*	*90.251*	*90.251*	*90.251*	*90.251*	*90.251*	*90.251*	
Zwischensumme		*88.160*	*68.314*	*90.251*	*90.251*	*90.251*	*90.251*	*90.251*	*90.251*	*90.251*	
abzüglich Freibetrag 100.000 €		*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	
Hinzurechnung	25%	0	0	0	0	0	0	0	0	0	
gewst. Ergebnis		1.537.710	1.513.730	1.432.868	1.211.638	932.108	895.346	880.017	863.030	830.151	
./. Freibetrag (24.500)		-24.500	-24.500	-24.500	-24.500	-24.500	-24.500	-24.500	-24.500	-24.500	
zu versteuerndes Ergebnis		**1.513.210**	**1.489.230**	**1.408.368**	**1.187.138**	**907.608**	**870.846**	**855.517**	**838.530**	**805.651**	**9.876.098**
Hebesatz	320%										
Gewerbesteuer Messbetrag	3,5%	52.962	52.123	49.293	41.550	31.766	30.480	29.943	29.943	29.943	
Gewerbeertragsteuer gesamt		**169.480**	**166.794**	**157.737**	**132.959**	**101.652**	**97.535**	**95.818**	**95.818**	**95.818**	**1.113.610**

3) Profitability Outlook WESU Original: Best-case scenario

Szenario für WESU "Best-Case"	Referenz *1 2011	12 2012	13 2013	14 2014	15 2015	16 2016	17 2017	18 2018	19 2019	20 2020	kum.	Mitte 2014 - 2020 kum.
Stromerlöse	2.193.784	2.286.279	2.286.279	2.286.279	2.286.279	2.286.279	2.286.279	2.286.279	2.286.279	2.286.279	20.576.511	14.860.814
Zinserträge	13.673	9.504	9.491	15.368	19.704	20.048	15.395	8.890	442	651	99.493	72.814
Erlöse aus Direktvermarktung *2		160.793	132.403	105.521	79.643						478.360	132.403
Ertragsausfallzahlungen	3.765										0	0
Erträge gesamt	**2.211.222**	**2.456.576**	**2.428.173**	**2.407.168**	**2.385.626**	**2.306.327**	**2.301.674**	**2.295.169**	**2.286.721**	**2.286.930**	**21.154.364**	**15.066.031**
Aufwendungen												
Partnerschaftsvereinbarung/Reparaturen *3	331.200	341.136	351.370	361.911	555.955	750.000	772.500	795.675	819.545	844.132	5.592.224	4.718.762
Bonus		25.000	25.000	25.000	25.000	25.000	25.000	25.000	25.000	25.000	225.000	162.500
Pachtaufwendungen	135.705	142.177	142.177	187.902	187.902	187.902	187.902	187.902	187.902	187.902	1.599.670	1.221.365
Verwaltung / Funktionsüberw.	123.733	127.445	131.268	135.206	139.262	143.440	147.743	152.176	156.741	161.443	1.294.723	968.408
Technische Betreuung WEA u. Pherepherie	19.895	20.492	21.107	21.740	22.392	23.064	23.756	24.469	25.203	25.959	208.181	155.712
Versicherungen	51.525	53.071	54.663	56.303	57.992	59.732	61.524	63.370	65.271	67.229	539.155	403.269
Komplementärvergütung	4.030	4.232	4.443	4.666	4.899	5.144	5.401	5.671	5.955	6.252	46.662	35.654
Steuerberatung, Jahresabschluss	5.960	6.139	6.323	6.513	6.708	6.909	7.117	7.330	7.550	7.776	62.365	46.647
Rückbauverpflichtung	14.485	14.485	14.485	14.485	14.485	14.485	14.485	14.485	14.485	14.485	130.365	94.153
Abschreibungen	50.133	45.924	45.924	45.924	45.924	45.924	45.924	22.953	22.953	22.953	344.403	229.593
Eigenstromverbrauch	14.347	14.777	15.220	15.677	16.147	16.632	17.131	17.645	18.174	18.719	150.123	112.286
Sonstiges	10.381	10.692	11.013	11.343	11.684	12.034	12.395	12.767	13.150	13.544	108.622	81.246
Zinsaufwand	23.513	7.044									7.044	0
Disagio	11.419	12.802									12.802	0
Aufwendungen vor Gewerbesteuer	796.325	825.415	822.993	886.670	1.088.351	1.290.266	1.320.878	1.329.442	1.361.928	1.395.395	10.321.338	8.229.595
Gewerbesteuer	173.995	179.946	177.036	167.552	142.551	111.055	107.105	105.417	105.417	105.417	1.201.497	760.739
Aufwendungen gesamt	970.320	1.005.361	1.000.030	1.054.222	1.230.902	1.401.321	1.427.983	1.434.859	1.467.346	1.500.812	11.522.835	8.990.334
Partnerschaftsvereinbarung (Bonuskompensation)	4.901										0	0
Jahresüberschuss vor WEA Dörpen	1.245.803	1.451.215	1.428.144	1.352.946	1.154.724	905.006	873.691	860.310	819.375	786.118	9.631.528	6.075.697
Steuerlicher Ergebnisanteil WEA Dörpen	168.361	85.000	85.000	85.000	85.000	85.000	85.000	85.000	85.000	85.000	765.000	552.500
Ergebnis kumuliert	1.414.164	1.536.215	1.513.144	1.437.946	1.239.724	990.006	958.691	945.310	904.375	871.118	10.396.528	6.628.197
Liquiditätsprognose												
Jahresüberschuss vor WEA Dörpen	1.245.803	1.451.215	1.428.144	1.352.946	1.154.724	905.006	873.691	860.310	819.375	786.118	9.631.528	6.075.697
zzgl. Zuführung Rückst. Rückbau	14.485	14.485	14.485	14.485	14.485	14.485	14.485	14.485	14.485	14.485	130.365	94.153
zzgl. Abschreibungen	50.133	45.924	45.924	45.924	45.924	45.924	45.924	22.953	22.953	22.953	344.403	229.593
zzgl. Abschreibung Disagio	11.419	12.802								0	12.802	0
abzgl. einbehaltene Zinsabschlagssteuer	-3.596	-3.008	-3.004	-4.864	-6.236	-6.345	-4.872	-2.814	-140	-206	-31.489	-23.045
abzgl. Tilgung	-329.272	-330.377									-330.377	0
Barausschüttung	**-1.130.620**	**-1.256.244**	**-1.256.244**	**-1.256.244**	**-1.256.244**	**-1.256.244**	**-1.319.056**	**-1.381.869**	**-910.777**	**-910.777**	**-10.803.700**	**-7.663.089**
Barausschüttung in Prozent	**18,00%**	**20,00%**	**20,00%**	**20,00%**	**20,00%**	**20,00%**	**21,00%**	**22,00%**	**14,50%**	**14,50%**	**172,00%**	**122,00%**
Liquiditätsüberschuss	-141.648	-65.203	229.305	152.247	-47.347	-297.174	-389.828	-486.934	-54.104	-87.427	-1.046.467	-1.286.692
Liquiditätsreserve am Jahresanfang	484.103	475.202	474.547	768.400	985.194	1.002.395	769.769	444.489	22.102	32.547	4.974.645	3.640.696
Liquiditätsüberschuss WEA Dörpen	153.199	85.000	85.000	85.000	85.000	85.000	85.000	85.000	85.000	85.000	765.000	552.500
Liquiditätsreserve	495.654	560.202	559.547	853.400	1.070.194	1.087.395	854.769	529.489	107.102	117.547	5.739.645	4.193.196
abzgl. Liquiditätszuführung Rückbaukonto	-20.452	-20.452	-20.452	-20.452	-20.452	-20.452	-20.452	-20.452	-20.452	-20.452	-184.068	-132.938
Liquiditätsreserve am Jahresende	**475.202**	**474.547**	**768.400**	**985.194**	**1.002.395**	**769.769**	**444.489**	**22.102**	**32.547**	**9.667**	**4.509.110**	**2.773.566**

*1 Das Referenzjahr 2011 gilt als angemessenes Basiswindjahr mit ca. 82 % der Stromerlöse im Vergleich zur Planrechnung

*2 Zusätzliche Zahlungen an WESU über den EEG-Vergütungspreis (2012 - 0,640 Cent/kWh; 2013 - 0,527 Cent/kWh; 2014 - 0,420 Cent/kWh; 2015 - 0,317 Cent/kWh)

*3 Aus Vereinfachungsgründen wurden nach dem Auslaufen der Partnerschaftsvereinbarung 75.000 € pro WEA (1.5i) angenommen. Weiterhin wurde zugrunde gelegt, dass Bonuszahlungen in Höhe von 25.000 € an GE fällig werden.

Berechnung der GewSt			2012	2013	2014	2015	2016	2017	2018	2019	2020	
Verlustvortrag Ende 2011: **0**												
Ergebnis vor Steuer			1.631.161	1.605.180	1.520.497	1.297.275	1.016.061	980.797	965.727	924.793	891.535	10.833.025
Darlehenszinsen / Disagio	100%		*19.846*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	
Pachten	50%		*71.088*	*71.088*	*93.951*	*93.951*	*93.951*	*93.951*	*93.951*	*93.951*	*93.951*	
Zwischensumme			*90.934*	*71.088*	*93.951*	*93.951*	*93.951*	*93.951*	*93.951*	*93.951*	*93.951*	
abzüglich Freibetrag 100.000 €			*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	
Hinzurechnung	25%		0	0	0	0	0	0	0	0	0	
gewst. Ergebnis			1.631.161	1.605.180	1.520.497	1.297.275	1.016.061	980.797	965.727	924.793	891.535	
./. Freibetrag (24.500)			-24.500	-24.500	-24.500	-24.500	-24.500	-24.500	-24.500	-24.500	-24.500	
zu versteuerndes Ergebnis			**1.606.661**	**1.580.680**	**1.495.997**	**1.272.775**	**991.561**	**956.297**	**941.227**	**900.293**	**867.035**	**10.612.525**
Hebesatz	320%											
Gewerbesteuer Messbetrag	3,5%		56.233	55.324	52.360	44.547	34.705	33.470	32.943	32.943	32.943	
Gewerbeertragsteuer gesamt			**179.946**	**177.036**	**167.552**	**142.551**	**111.055**	**107.105**	**105.417**	**105.417**	**105.417**	**1.201.497**

Appendix B

Profitability Forecast WESU Original: Arbitax AG, 1 July 2004

Wesu Windenergie Sustrum GmbH & Co. KG

Planrechnung ab 1. Juli 2004

Ergebnisvorschau	2012	2013	2014	2015	2016	2017	2018
Laufendes Jahr	9	10	11	12	13	14	15
	Euro	Euro	Euro	Euro	Euro	Euro	Euro
Einnahmen							
Stromerlöse	2.689.740	2.689.740	2.689.740	2.689.740	2.689.740	2.689.740	2.689.740
Zinserträge	36.239	38.397	41.264	40.220	38.289	35.664	27.102
Summe Einnahmen	2.725.979	2.728.137	2.731.004	2.729.968	2.728.029	2.725.404	2.716.842
Aufwendungen							
Partnerschaftsvereinbarung / Reparaturen	419.554	432.141	492.640	556.381	573.072	590.264	607.972
Pachtaufwendungen	164.452	164.452	218.247	218.247	218.247	218.247	218.247
Verwaltung/Geschäftsführung/Funktionsüberwachung	146.457	149.386	152.374	155.421	158.529	161.700	164.934
Technische Betreuung WKA und Pherepherie	28.705	29.566	30.453	31.367	32.308	33.277	34.275
Versicherungen	61.493	63.338	65.238	67.195	69.211	71.287	73.426
Komplementärvergütung	5.062	5.315	5.581	5.860	6.153	6.461	6.784
Steuerberatung	9.668	9.958	10.257	10.565	10.882	11.208	11.544
Rückstellung für Rückbauverpflichtung	20.452	20.452	20.452	20.452	20.452	20.452	20.452
Abschreibungen	45.924	45.924	45.924	45.924	45.924	45.924	22.953
Eigenstromverbrauch	22.168	22.834	23.519	24.224	24.951	25.699	26.470
Sonstiges	35.760	36.833	37.938	39.076	40.248	41.455	42.699
Zinsaufwand	7.044	-	-	-	-	-	-
Disagio	12.802	-	-	-	-	-	-
Gewerbesteuer	229.014	228.777	212.767	202.992	199.380	195.582	193.969
Summe Aufwendungen	1.208.555	1.208.976	1.315.390	1.377.704	1.399.357	1.421.556	1.423.725
Jahresüberschuss	1.517.424	1.519.161	1.415.614	1.352.264	1.328.672	1.303.848	1.293.117
Steuerlicher Ergebnisanteil WKA Dörpen	103.522	99.975	99.611	98.641	97.019	95.350	96.083
Ergebnis kumuliert	1.620.946	1.619.136	1.515.225	1.450.905	1.425.691	1.399.198	1.389.200
Liquiditätsprognose							
Jahresüberschuss	1.517.424	1.519.161	1.415.614	1.352.264	1.328.672	1.303.848	1.293.117
zzgl. bereits gezahlter Versicherungsbeitrag für 2004							
zzgl. Zuführung Rückst. für Rückbauverpflichtung	20.452	20.452	20.452	20.452	20.452	20.452	20.452
zzgl. Abschreibungen Sachanlagevermögen	45.924	45.924	45.924	45.924	45.924	45.924	22.953
zzgl. Abschreibung Disagio	12.802	-	-	-	-	-	-
abzgl. Zinsabschlagsteuer/Solidaritätszuschlag	- 11.470	- 12.153	- 13.060	- 12.732	- 12.118	- 11.288	- 8.578
abzgl. Tilgung Bankdarlehen	- 330.377	-	-	-	-	-	-
abzgl. Rückbaukosten							- 409.034
abzgl. Ausschüttungen an Kommanditisten	-1.392.804	-1.393.330	-1.556.101	-1.561.894	-1.564.137	-1.566.492	-1.567.363
Liquiditätsüberschuss	- 138.049	180.054	- 87.171	- 155.986	- 181.207	- 207.556	- 648.453
Liquid.best. am 1.7.2004 (incl. WKA Dörpen)							
lfd. Liquidität aus der WKA Dörpen	83.113	88.455	88.901	112.300	110.679	109.009	102.913
Liquid.zufhg z. Rückbaukonto incl. Vortrag	- 20.452	- 20.452	- 20.452	- 20.452	- 20.452	- 20.452	- 20.452
Liquiditätsreserve am Jahresende	1.391.402	1.639.459	1.620.737	1.556.509	1.465.619	1.346.620	780.628
Ausschüttung							
Barausschüttung	1.392.804	1.393.330	1.556.101	1.561.894	1.564.137	1.566.492	1.567.363
anrechenbare Zinsabschlagsteuer (incl. SolZ)	11.470	12.153	13.060	12.732	12.118	11.288	8.578
Barausschüttung in Prozent	22,17%	22,18%	24,77%	24,87%	24,90%	24,94%	24,95%
GewSt-Anr gem. § 35 EStG (Wesu)	132.976	132.838	123.542	117.866	115.769	113.564	112.627
GewSt-Anr gem. § 35 EStG (WKA Dörpen)	8.096	7.708	7.620	7.503	7.357	7.207	7.273
Ausschüttung (incl. GewSt-Anr.) in Euro	1.533.876	1.533.876	1.687.263	1.687.263	1.687.263	1.687.263	1.687.263
Ausschüttung (incl. GewSt-Anr.) in Prozent des Kommanditkapitals	24,42%	24,42%	26,86%	26,87%	26,86%	26,86%	26,86%

Appendix C

Local Legal Regulation: Height Restriction

---------- Weitergeleitete Nachricht ----------

Von: Berghaus & Partner, Aurich <kanzlei@rechtsanwaelte-berghaus.de>

Datum: 18. Februar 2013 10:23

Betreff: AW: Verständnisfrage zur Nabenhöhe

An: j.cossmann@w-n-e.de

Sehr geehrter Herr Coßmann,

es handelt sich um die Anlagengesamthöhe über dem gewachsenen Boden, nicht über NN. Die Anhebung des Tiefflugbandes erfolgt im Einzelfall nach Stellung des BImSch-Antrages, ist aber für alle Fälle grundsätzlich entschieden worden (Ausnahme im Bereich Emsland/Grafschaft nur Endanflug auf Nordhorn-Range). Das gilt im Übrigen bundesweit für alle Strahlflugzeugtiefflugstrecken und ist ein Ergebnis unserer Arbeit im Sprecherkreis des Arbeitskreises Radar im BWE.

Mit freundlichen Grüßen

Berghaus

Rechtsanwalt

Von: Coßmann, Jürgen [mailto:cossmann@w-n-e.de]

Gesendet: Dienstag, 12. Februar 2013 14:47

An: Berghaus

Betreff: Verständnisfrage zur Nabenhöhe

Guten Tag Herr Berghaus,

zunächst möchten wir uns für das informative Gespräch bedanken.

Zur Klarstellung:

Handelst es sich bei der max. Höhe von 200 m um die Maschinenhöhe oder um die Höhe über NN?

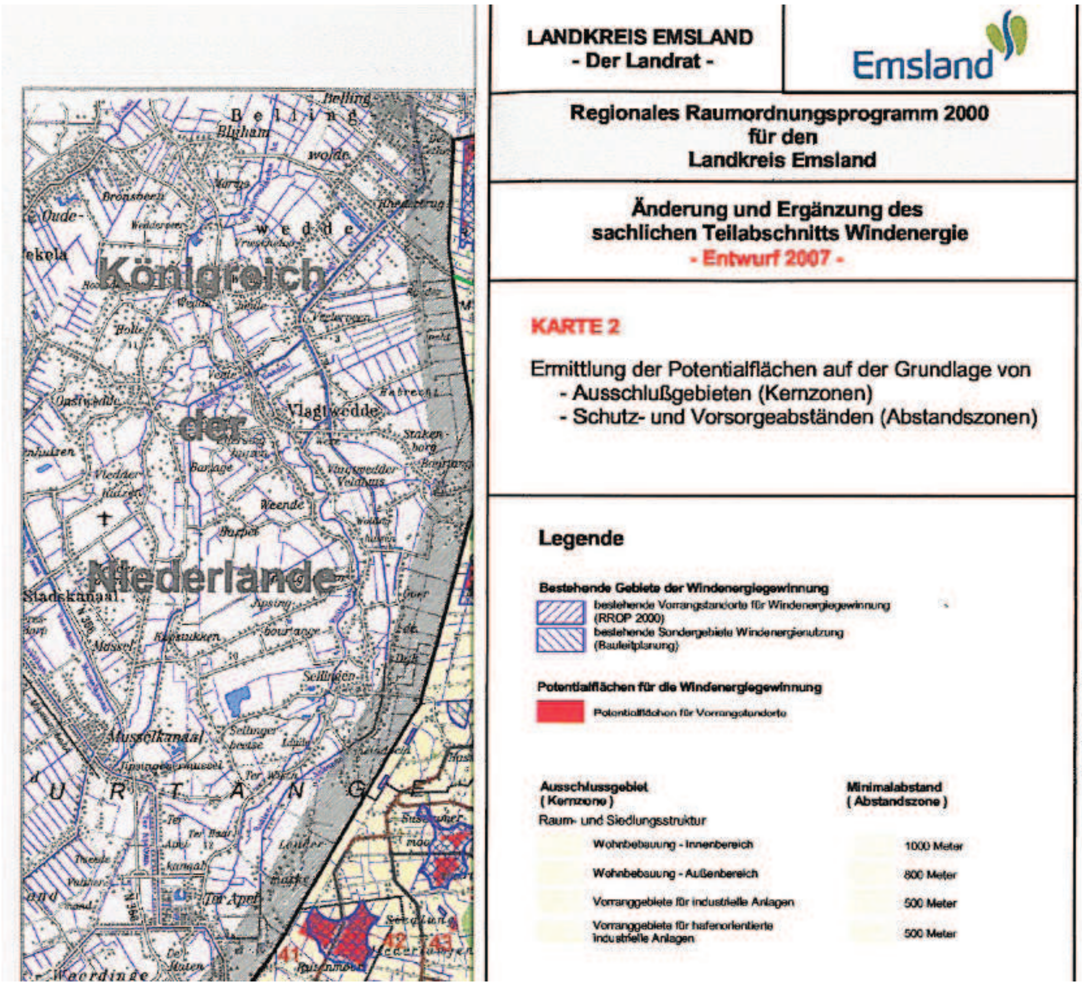
Mit freundlichen Grüßen

Jürgen Coßmann

WnE GmbH

Appendix D

Regional Spatial Plan Emsland (RROP)



Appendix E

Investment E-101 WESU Repowering and WP Sustrum Süd

Anzahl WEA	**3**	**1**
E 101 inkl. Trafo/Fundament *		
Ausgleichsmaßnahmen		
Projektierung		
Zinsen / Bereitstellung / Aval bis IB		
ext./int Verk., Netzanb., Ü-Station		
UW- Erweiterung/Errichtung		
Erschließung / Wegebau		
Sondernutzungsrecht Gemeinde		
Sonstiges (Gutachten/Telefon/Gebühren usw.)		
Verwaltung / Überwachung / GF bis IB		
	14.545.000,00 €	**4.848.333,33 €**

Angebotspreis E-101 3.0 MW NH 135m * Stand: 13. Feb 13

Einzelpositionen	**Einzelrichtpreis**	**Angebot**
Grundpreis Anlage		
FACTS-Leistungsmerkmale		inkl.
Q+-Option		inkl.
Tageskennzeichnung rot/grau/rot		inkl.
Nachtkennzeichnung W-Rot		inkl.
Turmbefeuerung		inkl.
Tiefgründungsfundament mit Pfahllänge bis 20m		
Flachgründungsfundament mit Auftriebsicherung		
Gesamt		

* Wir nehmen an, dass die Höhenbegrenzung von 182m über NN in Sustrum entfällt. Stattdessen darf bis 200m über natürlichem Boden gebaut werden (Stand 13.02.2013 laut Rechtanwalt Berghaus). Daher wird eine maximale Turmhöhe von 135m angesetzt (zzgl. Flügelradius von 50,5m).

Appendix F

Investment Plan E-101 WESU Repowering

W n E GmbH
Große Straße 14
26871 Aschendorf

Gesellschaften:		
"WESU Repowering"	Datum der Bearbeitung:	13.02.2013
	Bearbeiter:	S. Jansen
	Gründungsjahr:	2014

Investitionsplan	in %	in Euro	AfA-Zeitraum
E-101 inkl. Trafo / Fundament			
Verwaltung / GF bis IB			
Ausgleichsmaßnahmen			
Standorte / UVP / Bimsch-Gen.			
Zinsen, Bereitstellung, Aval bis IB			
ext./int Verk., Netzanb., Ü-Station			
Erschließung / Wegebau			
Projektentwicklung/Rechtsberatung			
Sondernutzungsrecht Gemeinde			
Sonstiges (Gutachten/Telefon/Gebühren usw.)			
Zwischensumme	**100,00%**	**14.545.000,00 €**	
Liquiditäts- / Kostenreserve	**0,00%**	**- €**	**kein Aufwand**
Disagio	**0,0%**	**- €**	**15 Jahre**
Summe Investitionskosten	**100,0%**	**14.545.000,00 €**	

Parkdaten			
Standort	**Sustrum**	Aufstelljahr	**2014**
WKA- Typ	**E-101 3.0 MW**	Inbetriebnahme	**Juli**
Nabenhöhe	**135 m**	Monate im IB-Jahr	**6**
Rotordurchmesser	**101 m**		
Wind in Narbenhöhe			
WEA-Anzahl	**3**		

Finanzierungsplan				
Fremdkapital				
Kfw "Erneuerbare Energie"				
Betrag	**33,00%**	4.800.000,00 €		
Tilgungsfrei		2,0 Jahre		
Zinssatz		2,00 %		
Laufzeit		10 Jahre		
Kfw "Erneuerbare Energie"				
Betrag	**67,00%**	9.745.000,00 €	Disagio	- €
Tilgungsfrei		3,0 Jahre		
Zinssatz		2,50 %		
Laufzeit		15 Jahre		
Euribor				
Betrag	**0,00%**	- €		
Tilgungsfrei		0,0 Jahre		
Zinssatz		2,25 %		
Laufzeit		3 Jahre		
Eigenkapital				
Kommanditisten / WESU Original *1	**0,00%**	**6.281.220,76 €**		
Summe Finanzierung	**100,00%**	**14.545.000,00 €**		

Laufende Erträge			
Energieprognose (nach Parkwirkung) *2		**24.645.338 kWh**	
abzgl. Parkwirkung *3	5,00%	1.232.267 kWh	**23.413.071 kWh**
abzgl. Verfügbarkeitsabschlag	3,00%	702.392 kWh	22.710.679 kWh
abzgl. Leitungsverluste	2,00%	454.214 kWh	22.256.465 kWh
abzgl. Schatten/Eis	0,00%	0 kWh	22.256.465 kWh
abzgl. Sicherheit	10,00%	2.464.534 kWh	**19.791.931 kWh**
Einspeisevergütung pro KWh *4	für	20 volle Jahre	0,0915 € pro KWh
Einspeisevergütung gesamt			**1.810.961,70 €**
		danach	0,0000 € pro KWh
			- €
Überziehungszinssatz	5,00%		
Kontokorrent Zinssatz für Guthaben	1,00%		

Allgemeine Daten		
Gewerbesteuerhebesatz		320%
Darlehen	anteilig	0,5

Laufender Aufwand		ab 1. volles Jahr		ab 3. volles Jahr		ab 6. volles Jahr		ab 11. volles Jahr	Steig. in %
Strombezug		3.000,00 €		3.182,70 €		3.477,82 €		4.031,75 €	3,00%
EPK		- €		108.855,62 €		237.697,14 €		275.556,13 €	3,00%
Pachtaufwand inkl. Festbetrag	6%	110.907,70 €	6%	110.907,70 €	6%	110.907,70 €	8%	147.126,94 €	10.000 / MW
Verwaltung/Geschäftsf./ techn. Überwachung		90.548,09 €		93.284,90 €		97.546,00 €		105.084,75 €	1,50%
Haftpflichtversicherung		300,00 €		318,27 €		347,78 €		403,17 €	3,00%
Maschinenbruch-/ BU-Vers.		11.700,00 €		12.412,53 €		13.563,51 €		15.723,82 €	3,00%
Komplementärvergütung		2.500,00 €		2.500,00 €		2.500,00 €		2.500,00 €	
Steuerberatung / Jahresbilanz		6.000,00 €		6.365,40 €		6.955,64 €		8.063,50 €	3,00%
Sonstiges		15.000,00 €		15.009,00 €		15.022,51 €		15.045,06 €	3,00%
Zinsaufwand ab Fertigstellung		339.625,00 €		322.549,48 €		230.718,75 €		162.416,67 €	
Überziehungszinsen		- €		- €		164.481,81 €		414.297,46 €	
Gewerbesteuer		41.099,71 €		28.680,24 €		1.089,05 €		- €	
Avalprovision		4.000,00 €		4.000,00 €		4.000,00 €		4.000,00 €	
Gründungskosten "Afa"		- €		- €		- €		- €	
Disagio		- €		- €		- €		- €	15 Jahre
Rückstellung für Rückbau		27.000,00 €		27.000,00 €		27.000,00 €		27.000,00 €	
Abschreibung		909.062,50 €		909.062,50 €		909.062,50 €		909.062,50 €	16 Jahre
Summe Aufwand		**1.560.743,00 €**		**1.644.128,35 €**		**1.824.370,23 €**		**2.090.311,75 €**	

*1 bei Gründung WESU 12.285.000 DM, somit 6.281.220 €.
*2 Als Berechnungsgrundlage dient die anemos-Windanalyse für den Windpark Ohne. Wahrscheinlichkeit P75 (75%) 93.886,5 MWh/Jahr für 16 WEA - Umrechnung auf 3 WEA. Die 10 m Differenz in der NH (125 m zu 135 m) werden mit 10 % Mehrertrag kalkuliert. 1 % pro Höhenmeter. Zusätzlich wird durch den besseren Standort in Sustrum ein Mehrertrag von 30 % im Vergleich zu Ohne erwartet. Diese Einschätzung basiert auf einen Ertragsvergleich baugleicher Anlagen (GE 1.5sl) in Ohne und Sustrum.
*3 Im Gegensatz zu Ohne (16 WEA) wird die Parkwirkung im Windpark Sustrum deutlich höher ausfallen. Derzeit besteht der Windpark aus 29 WEA. Daher wird eine zusätzliche Parkwirkung von 5 % einkalkuliert.
*4 Im Jahr 2014 Anfangsvergütung 8,66 €/Cent pro kWh zzgl. 0,49 €/Cent Repowering-Bonus.

Appendix G

Investment Plan E-101 WP Sustrum Süd

W n E GmbH
Große Straße 14
26871 Aschendorf

Gesellschaften:		
"WP Sustrum Süd"	Datum der Bearbeitung:	**13.02.2013**
Übernahme WESU Repowering	Bearbeiter:	**S. Jansen**
in 2019	Gründungsjahr:	**2014**

Parkdaten			
Standort	**Sustrum**	Aufstelljahr	**2019**
WKA- Typ	**E-101 3.0 MW**	Inbetriebnahme	**Januar**
Nabenhöhe	**135 m**	Monate im IB-Jahr 2014	**6**
Rotordurchmesser	**101 m**		
Wind in Narbenhöhe			
WEA-Anzahl	**3**		

Investitionsplan ab 2014	in %	in Euro	AfA-Zeitraum
E-101 inkl. Trafo / Fundament			
Verwaltung / GF bis IB			
Ausgleichsmaßnahmen			
Standorte / UVP / Bimsch-Gen.			
Zinsen, Bereitstellung, Aval bis IB			
ext./int Verk., Netzanb., Ü-Station			
Erschließung / Wegebau			
Projektentwicklung/Rechtsberatung			
Sondernutzungsrecht Gemeinde			
Sonstiges (Gutachten/Telefon/Gebühren usw.)			
Zwischensumme	**100,0%**	**14.545.000,00 €**	
Liquiditäts- / Kostenreserve	**0,0%**	**- €**	**kein Aufwand**
Disagio	**0,0%**	**- €**	**15 Jahre**
Summe Investitionskosten	**100,0%**	**14.545.000,00 €**	

Finanzierungsplan				
Fremdkapital				
Kfw "Erneuerbare Energie"				
Betrag	**33,00%**	4.800.000,00 €		
Tilgungsfrei		2,0 Jahre		
Zinssatz		2,00 %		
Laufzeit		10 Jahre		
Kfw "Erneuerbare Energie"				
Betrag	**67,00%**	9.745.000,00 €	Disagio	- €
Tilgungsfrei		3,0 Jahre		
Zinssatz		2,50 %		
Laufzeit		15 Jahre		
Bankdarlehen				
Betrag	**0,00%**	1.500.000,00 €		
Tilgungsfrei		0,0 Jahre		
Zinssatz		4,00 %		
Laufzeit		10 Jahre		
Eigenkapital				
Kommanditisten / Neu 2019 *1	**22,00%**	**3.200.000,00 €**		
Summe Finanzierung	**100,00%**	**14.545.000,00 €**		

Laufende Erträge			
Energieprognose (nach Parkwirkung) *2		**24.645.338 kWh**	
abzgl. Parkwirkung *3	5,00%	1.232.267 kWh	**23.413.071 kWh**
abzgl. Verfügbarkeitsabschlag	3,00%	702.392 kWh	22.710.679 kWh
abzgl. Leitungsverluste	2,00%	454.214 kWh	22.256.465 kWh
abzgl. Schatten/Eis	0,00%	0 kWh	22.256.465 kWh
abzgl. Sicherheit	10,00%	2.464.534 kWh	**19.791.931 kWh**
Einspeisevergütung pro KWh *4	für	20 volle Jahre	0,0915 € pro KWh
Einspeisevergütung gesamt			**1.810.961,70 €**
		danach	0,0000 € pro KWh
			- €
Überziehungszinssatz	5,00%		
Kontokorrent Zinssatz für Guthaben	1,00%		

Allgemeine Daten		
Gewerbesteuerhebesatz		320%
Darlehen	anteilig	0,5

Laufender Aufwand		ab 1. volles Jahr		ab 3. volles Jahr		ab 6. volles Jahr		ab 11. volles Jahr	Steig. in %
Strombezug		3.376,53 €		3.582,16 €		3.914,32 €		4.537,77 €	3,00%
EPK		176.591,03 €		244.828,05 €		267.530,22 €		465.211,27 €	3,00%
Pachtaufwand inkl. Festbetrag	6%	110.907,70 €	6%	110.907,70 €	6%	110.907,70 €	8%	147.126,94 €	10.000 / MW
Verwaltung/Geschäftsf./ techn. Überwachung		96.104,44 €		99.009,19 €		103.531,77 €		111.533,12 €	1,50%
Haftpflichtversicherung		337,65 €		358,22 €		391,43 €		453,78 €	3,00%
Maschinenbruch-/ BU-Vers.		13.168,45 €		13.970,41 €		15.265,85 €		17.697,30 €	3,00%
Komplementärvergütung		2.500,00 €		2.500,00 €		2.500,00 €		2.500,00 €	
Steuerberatung / Jahresbilanz		6.753,05 €		7.164,31 €		7.828,64 €		9.075,54 €	3,00%
Sonstiges		15.018,01 €		15.027,02 €		15.040,55 €		15.063,12 €	3,00%
Zinsaufwand ab Fertigstellung		323.020,83 €		246.416,67 €		239.020,83 €		10.151,04 €	
Überziehungszinsen									
Gewerbesteuer		8.360,42 €		9.097,67 €		4.830,94 €		- €	
Abschreibung nachträgl. Investitionskosten		93.750,00 €		93.750,00 €		93.750,00 €		93.750,00 €	
Avalprovision		4.000,00 €		4.000,00 €		4.000,00 €		4.000,00 €	
Gründungskosten "Afa"		- €		- €		- €		- €	
Disagio		- €		- €		- €		- €	15 Jahre
Rückstellung für Rückbau		27.000,00 €		27.000,00 €		27.000,00 €		27.000,00 €	
Abschreibung		909.062,50 €		909.062,50 €		909.062,50 €		909.062,50 €	16 Jahre *5
Summe Aufwand		**1.789.950,62 €**		**1.786.673,90 €**		**1.804.574,75 €**		**1.817.162,38 €**	

*1 bei Gründung WESU 12.285.000 DM, somit 6.281.220 €. Ab 2019 neue Gesellschaft mit EK 3.200.000 €. Das Bankdarlehen in Höhe von 1.500.000,00 € wird zu 100 % finanziert, kein EK- Anteil dafür vorgesehen.
*2 Als Berechnungsgrundlage dient die anemos-Windanalyse für den Windpark Ohne. Wahrscheinlichkeit P75 (75%) 93.886,5 MWh/Jahr für 16 WEA - Umrechnung auf 3 WEA. Die 10 m Differenz in der NH (125 m zu 135 m) werden mit 10 % Mehrertrag kalkuliert. 1 % pro Höhenmeter.
Zusätzlich wird durch den besseren Standort in Sustrum ein Mehrertrag von 30 % im Vergleich zu Ohne erwartet. Diese Einschätzung basiert auf einen Ertragsvergleich baugleicher Anlagen (GE 1.5sl) in Ohne und Sustrum.
*3 Im Gegensatz zu Ohne (16 WEA) wird die Parkwirkung im Windpark Sustrum deutlich höher ausfallen. Derzeit besteht der Windpark aus 29 WEA. Daher wird eine zusätzliche Parkwirkung von 5 % einkalkuliert.
*4 Im Jahr 2014 Anfangsvergütung 8,66 €/Cent pro kWh zzgl. 0,49 €/Cent Repowering-Bonus.
*5 Basis ab 2014 bis 2030.

Appendix H

Profit and Loss Forecast WESU Repowering E-101

Ergebnisprognose	1 2014	2 2015	3 2016	4 2017	5 2018	kum.
Erträge						
Einspeisevergütung	905.481	1.810.962	1.810.962	1.810.962	1.810.962	8.149.328
Zinserträge	5.000	28.187	27.678	23.692	12.251	96.808
Verkauf Standortrechte *1	1.200.000					1.200.000
Verkauf WEA Dörpen *2	625.000					625.000
Verkauf Repowering-Anspruch *3	1.402.120					
Kompensation EEG-Vergütung 2019-2020 *4	1.265.206					
Überschuss aus Verkauf *5					1.500.000	
Erträge gesamt	**5.402.807**	**1.839.148**	**1.838.639**	**1.834.654**	**3.323.213**	**14.238.462**
Aufwendungen						
Strombezug	1.500	3.000	3.090	3.183	3.278	14.051
Pachtaufwendungen inkl. Festbetrag *6	55.454	110.908	110.908	110.908	110.908	499.085
EPK *7	0	0	54.428	108.856	112.121	275.405
Versicherungen	6.000	12.000	12.360	12.731	13.113	56.204
Komplementärvergütung	2.500	2.500	2.500	2.500	2.500	12.500
Verwaltung/Geschäftsf./ techn. Überwachung	45.274	90.548	91.906	93.285	94.684	415.698
Steuerberatung / Jahresbilanz	6.000	6.000	6.180	6.365	6.556	31.102
Rückstellung für Rückbau *8	27.000	27.000	27.000	27.000	27.000	135.000
Abschreibung	454.531	909.063	909.063	909.063	909.063	4.090.781
Sonstiges	7.500	15.000	15.005	15.009	15.014	67.527
Zinsaufwand ab Fertigstellung	169.813	339.625	336.625	322.549	295.323	1.463.935
Avalprovision	2.000	4.000	4.000	4.000	4.000	18.000
Aufwendungen vor Gewerbesteuer	**777.572**	**1.519.643**	**1.573.064**	**1.615.448**	**1.593.559**	**7.079.286**
Gewerbesteuer (siehe Berechnung)	522.768	41.303	35.179	29.591	197.999	826.840
Aufwendungen inkl. Gewerbesteuer	1.300.340	1.560.946	1.608.243	1.645.039	1.791.558	7.906.126
Jahresgewinn / Verlust	**4.625.235**	**319.505**	**265.576**	**219.206**	**1.729.654**	**7.159.175**

	Liquiditätsprognose						
	Jahresgewinn / Verlust	4.625.235	319.505	265.576	219.206	1.729.654	7.159.175
	zzgl. Zuführung Rückstellung	27.000	27.000	27.000	27.000	27.000	135.000
	zzgl. Abschreibung	454.531	909.063	909.063	909.063	909.063	4.090.781
	abzgl. einbehaltene Zinsabschlagsteuer	-1.583	-8.921	-8.760	-7.499	-3.878	-30.640
	abzgl. GewSt	-522.768	-41.303	-35.179	-29.591	-197.999	-826.840
	abzgl. Tilgung	0	0	-300.000	-1.006.042	-1.412.083	-2.718.125
	abzgl. Ausschüttungen	**-2.198.427**	**0**	**0**	**0**	**-1.004.995**	**-3.203.423**
	Prognostizierte Ausschüttung WESU Original	**-565.310**	**-1.256.244**	**-1.256.244**	**-1.256.244**	**-1.256.244**	**-5.590.286**
	Ausschüttung in % zum EK	**35,00%**	**0,00%**	**0,00%**	**0,00%**	**16,00%**	**51,00%**
	Ausschüttung in % zum EK WESU Original	**9,00%**	**20,00%**	**20,00%**	**20,00%**	**20,00%**	**89,00%**
	Liquiditätsüberschuss	1.818.678	-50.900	-398.545	-1.144.107	-1.209.483	-984.357
	Liquiditätsreserve per 01.07. *9	1.000.000					1.000.000
	Liquiditätsreserve vor Verpfändung	**2.818.678**	**2.767.778**	**2.369.233**	**1.225.126**	**15.643**	**9.196.459**
	Einzahlung auf Rückbaukonto	*60.000*	*60.000*	*60.000*	*60.000*	*60.000*	300.000
	Verpfändung Rückbau (kummuliert)	60.000	120.000	180.000	240.000	300.000	
40	% Kapitaldienst Folgejahr (verpfändet)	0	0	531.436	682.963	670.042	
	Liquiditätsreserve nach Verpfändung	**2.758.678**	**2.647.778**	**1.657.797**	**302.164**	**-954.399**	**6.412.019**
Cash Flow		*4.186.918*	*288.725*	*238.080*	*184.484*	*1.502.918*	
Kapitaldienst		*169.813*	*339.625*	*636.625*	*1.328.591*	*1.707.406*	
DSCR		*2466%*	*85%*	*37%*	*14%*	*88%*	

Zins- und Tilgungsplan			0,5 2014	1,5 2015	2,5 2016	3,5 2017	4,5 2018	
Kfw "Erneuerl	**4.800.000**							
Laufzeit:	10,00 Jahre	Tilgung	0	0	300.000	600.000	600.000	1.500.000
Tilgungsfrei:	2,00 Jahre	Tilgung kum.	0	0	300.000	900.000	1.500.000	
Zinssatz:	2,00 %	Zinsen	48.000	96.000	93.000	84.000	72.000	393.000
Kfw "Erneuerl	**9.745.000**							
Laufzeit:	15,00 Jahre	Tilgung	0	0	0	406.042	812.083	1.218.125
Tilgungsfrei:	3,00 Jahre	Tilgung kum.	0	0	0	406.042	1.218.125	
Zinssatz:	2,50 %	Zinsen	121.813	243.625	243.625	238.549	223.323	1.070.935

Berechnung der GewSt		2014	2015	2016	2017	2018	
Ergebnis vor Steuer		4.625.235	319.505	265.576	219.206	1.729.654	7.159.175
Darlehenszinsen / Disagio	*100%*	*339.625*	*339.625*	*336.625*	*322.549*	*295.323*	
Pachten	*50%*	*27.727*	*55.454*	*55.454*	*55.454*	*55.454*	
Zwischensumme		*367.352*	*395.079*	*392.079*	*378.003*	*350.777*	
abzüglich Freibetrag 100.000 €		*267.352*	*295.079*	*292.079*	*278.003*	*250.777*	
Hinzurechnung	25%	66.838	73.770	73.020	69.501	62.694	
Hinzurechnung Vorlaufkosten		0	0	0	0	0	
gewst. Ergebnis		4.692.073	393.275	338.595	288.707	1.792.348	
Verlustvortrag			0	0	0	0	
Verlustfeststellung		4.692.073	393.275	338.595	288.707	1.792.348	
./. Freibetrag (24.500)		-24.500	-24.500	-24.500	-24.500	-24.500	
zu versteuerndes Ergebnis		**4.667.573**	**368.775**	**314.095**	**264.207**	**1.767.848**	**7.382.498**
Hebesatz	320%						
Gewerbesteuer Messbetrag	3,5%	163.365	12.907	10.993	9.247	61.875	
Gewerbeertragsteuer gesamt		**522.768**	**41.303**	**35.179**	**29.591**	**197.999**	**826.840**

Abschreibungen		0 2014	1 2015	2 2016	3 2017	4 2018	kum.
Sonder-AfA	§ 7g EStG in %	0,0%	0,0%	0,0%	0,0%	0,0%	
	in €	0	0	0	0	0	0
AK (lin)	14.545.000,00 €						
ND in Jahren	**16 Jahre**						
AfA-Satz	6,25%						
Abschreibung in Euro		454.531	909.063	909.063	909.063	909.063	4.090.781
Restbuchwert		14.090.469	13.181.406	12.272.344	11.363.281	10.454.219	

*1 Vier Standortrechte in Höhe von 100.000 € pro MW verkauft an neue Gesellschaft "WP Sustrum Nord" . Bei 3 MW WEA in Summe 1.200.000 €.
*2 Im Zuge des Repowering wurde die WEA Dörpen von WESU Original verkauft. Erlös gemäß Anteil WESU/WISTRO 10/16 von 1.000.000 €.
*3 Insgesamt werden 7 neue WEA in Sustrum installiert, um die 10 jetzigen WESU-Anlagen zu ersetzen. Bei 3 WESU RePow-Anlagen werden insgesamt 7 Repowering-Ansprüche verkauft. 4 Repowering-Ansprüche an die neue Gesellschaft "WP Sustrum Nord" und 3 an die WP Ohne-Erweiterung.
*4 EEG Vergütung läuft bis 2020. Zu erwartende Ausschüttungen belaufen sich auf 1.633.117 € (Barwertberechnung 1.265.206 €), dieser Betrag wird von der neuzugründenden Gesellschaft WP Sustrum Nord übernommen.
*5 Verkauf der Maschinen und Rechte an "WP Sustrum Süd": 500.000 € pro WEA.
*6 Laut neuen Pachtverträgen max. zu versiegelnde Fläche = 4.000 m² bei 0,25 € pro m². Im Schnitt wird mit 750 € pro WEA gerechnet.
*8 Als Rückstellung sind 60.000 € pro MW vorgesehen. Bei 3 MW per WEA (3) errechnet sich eine Gesamtrückstellung von 540.000 € berechnet auf 20 Jahre.
*9 Stand der Liquiditätsreserve von WESU Original Mitte 2014 (siehe Average Case Szenario)

Appendix I

Repowering-Bonus WESU Repowering E-101

Barwertberechnung / Kapitalwertberechnung

Repowering-Bonus

Jahr	Perioden (n)	Repowering- Bonus (K_1)	Wiederanlagezins (p) *1	Barwert in € (K_0) *2
2014	0,5	16.163	0,0507	15.769
2015	1,5	32.327	0,0507	30.015
2016	2,5	32.327	0,0507	28.567
2017	3,5	32.327	0,0507	27.189
2018	4,5	32.327	0,0507	25.877
…	…	…	…	…
2034	20,5	16.163	0,0507	5.864
kum.		**646.536**		**400.606**

Annahmen:

Energieprognose	6.597.310	kWh/Jahr
Wiederanlagezins (p)	5,07	%
Repowering- Bonus	0,49	€Cent/kWh
Anlagezeitraum (n)	20	Jahre

Repowering- Bonus pro WEA gesplittet (€): **200.303** (Zahlung an WESU Repowering Mitte 2014)

*1 gemäß Abzinsungszinssatztabelle der Deutsche Bundesbank vom 31.03.2013

*2 Formel: $K_0 = K_1/(1+p)^n$

Detailrechnung

Jahr	Periode	Bonus	Barwert
2014	0,5	16.163	15.769
2015	1,5	32.327	30.015
2016	2,5	32.327	28.567
2017	3,5	32.327	27.189
2018	4,5	32.327	25.877
2019	5,5	32.327	24.628
2020	6,5	32.327	23.440
2021	7,5	32.327	22.309
2022	8,5	32.327	21.232
2023	9,5	32.327	20.208
2024	10,5	32.327	19.233
2025	11,5	32.327	18.304
2026	12,5	32.327	17.421
2027	13,5	32.327	16.581
2028	14,5	32.327	15.781
2029	15,5	32.327	15.019
2030	16,5	32.327	14.294
2031	17,5	32.327	13.605
2032	18,5	32.327	12.948
2033	19,5	32.327	12.323
2034	20,5	16.163	5.864
			400.606

Appendix J

Profit and Loss Forecast WP Sustrum Süd E-101

"WP Sustrum Süd"

Ergebnisprognose

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	kum.
Erträge																	
Einspeisevergütung	1.810.962	1.810.962	1.810.962	1.810.962	1.810.962	1.810.962	1.810.962	1.810.962	1.810.962	1.810.962	1.810.962	1.810.962	1.810.962	1.810.962	1.810.962	1.810.962	28.975.387
Zinserträge	156	27.045	21.876	16.946	12.253	7.797	5.591	4.516	3.766	3.342	3.241	7.519	8.310	8.441	8.417	8.233	147.449
Erträge gesamt	**1.811.118**	**1.838.007**	**1.832.838**	**1.827.908**	**1.823.215**	**1.818.759**	**1.816.553**	**1.815.478**	**1.814.728**	**1.814.303**	**1.814.203**	**1.818.481**	**1.819.271**	**1.819.403**	**1.819.379**	**1.819.194**	**29.122.836**
Aufwendungen																	
Strombezug	3.377	3.478	3.582	3.690	3.800	3.914	4.032	4.153	4.277	4.406	4.538	4.674	4.814	4.959	5.107	5.261	68.060
Pachtaufwendungen inkl. Festbetrag *1	110.908	110.908	110.908	110.908	110.908	110.908	147.127	147.127	147.127	147.127	147.127	147.127	147.127	147.127	147.127	147.127	2.136.716
EPK *2	176.591	237.697	244.828	252.173	259.738	267.530	275.556	283.823	292.337	301.108	465.211	479.168	493.543	508.349	523.599	539.307	5.600.559
Versicherungen	13.506	13.911	14.329	14.758	15.201	15.657	16.127	16.611	17.109	17.622	18.151	18.696	19.256	19.834	20.429	21.042	272.241
Komplementärvergütung	2.500	2.500	2.500	2.500	2.500	2.500	2.500	2.500	2.500	2.500	2.500	2.500	2.500	2.500	2.500	2.500	40.000
Verwaltung/Geschäftsf./ techn. Überwachung	96.104	97.546	99.009	100.494	102.002	103.532	105.085	106.661	108.261	109.885	111.533	113.206	114.904	116.628	118.377	120.153	1.723.380
Steuerberatung / Jahresbilanz	6.753	6.956	7.164	7.379	7.601	7.829	8.063	8.305	8.555	8.811	9.076	9.348	9.628	9.917	10.215	10.521	136.120
Rückstellung für Rückbau *3	27.000	27.000	27.000	27.000	27.000	27.000	27.000	27.000	27.000	27.000	27.000	27.000	27.000	27.000	27.000	0	405.000
Abschreibung	909.063	909.063	909.063	909.063	909.063	909.063	909.063	909.063	909.063	909.063	909.062,50	454.531	0	0	0	0	10.454.219
Abschreibung nachträgliche Investitionskosten	93.750	93.750	93.750	93.750	93.750	93.750	93.750	93.750	93.750	93.750	93.750	93.750	93.750	93.750	93.750	93.750	1.500.000
Sonstiges	15.018	15.023	15.027	15.032	15.036	15.041	15.045	15.050	15.054	15.059	15.063	15.068	15.072	15.077	15.081	15.086	240.830
Zinsaufwand ab Fertigstellung	323.021	284.719	246.417	208.115	169.813	239.021	186.417	139.813	93.208	46.604	10.151	0	0	0	0	0	1.947.297
Avalprovision	4.000	4.000	4.000	4.000	4.000	4.000	4.000	4.000	4.000	4.000	4.000	4.000	4.000	4.000	4.000	4.000	64.000
Aufwendungen vor Gewerbesteuer	**1.781.590**	**1.806.549**	**1.777.576**	**1.748.861**	**1.720.411**	**1.799.744**	**1.793.764**	**1.757.854**	**1.722.241**	**1.686.934**	**1.817.162**	**1.369.067**	**931.595**	**949.140**	**967.186**	**958.747**	**24.588.421**
Gewerbesteuer (siehe Berechnung)	8.360	7.504	9.098	10.689	12.278	4.831	4.288	6.884	9.484	12.086	0	47.259	96.676	94.725	92.702	93.626	510.490
Aufwendungen inkl. Gewerbesteuer	1.789.951	1.814.053	1.786.674	1.759.550	1.732.688	1.804.575	1.798.052	1.764.739	1.731.725	1.699.020	1.817.162	1.416.326	1.028.271	1.043.866	1.059.887	1.052.373	25.098.911
Jahresgewinn / Verlust	**29.528**	**31.457**	**55.262**	**79.047**	**102.804**	**19.015**	**22.789**	**57.623**	**92.487**	**127.369**	**-2.959**	**449.414**	**887.677**	**870.262**	**852.193**	**860.448**	**4.534.415**

Liquiditätsprognose

Jahresgewinn / Verlust	29.528	31.457	55.262	79.047	102.804	19.015	22.789	57.623	92.487	127.369	-2.959	449.414	887.677	870.262	852.193	860.448	4.534.415
zzgl. Zuführung Rückstellung	27.000	27.000	27.000	27.000	27.000	27.000	27.000	27.000	27.000	27.000	27.000	27.000	27.000	27.000	27.000	0	405.000
zzgl. Abschreibung	909.063	909.063	909.063	909.063	909.063	909.063	909.063	909.063	909.063	909.063	909.063	454.531	0	0	0	0	10.454.219
zzgl. Abschreibung nachträgliche Investitionskosten	93.750	93.750	93.750	93.750	93.750	93.750	93.750	93.750	93.750	93.750	93.750	93.750	93.750	93.750	93.750	93.750	1.500.000
abzgl. einbehaltene Zinsabschlagsteuer	-50	-8.560	-6.924	-5.363	-3.878	-2.468	-1.770	-1.429	-1.192	-1.058	-1.026	-2.380	-2.630	-2.672	-2.664	-2.606	-46.668
abzgl. GewSt	-8.360	-7.504	-9.098	-10.689	-12.278	-4.831	-4.288	-6.884	-9.484	-12.086	0	-47.259	-96.676	-94.725	-92.702	-93.626	-510.490
abzgl. Tilgung	-1.562.083	-1.562.083	-1.562.083	-1.562.083	-1.562.083	-1.262.083	-962.083	-962.083	-962.083	-962.083	-406.042	0	0	0	0	0	-13.326.875
abzgl. Rückbaukosten inkl. Sanierung	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-540.000	-540.000
abzgl. Ausschüttungen	**0**	**0**	**0**	**0**	**0**	**0**	**-192.000**	**-192.000**	**-192.000**	**-192.000**	**-192.000**	**-896.000**	**-896.000**	**-896.000**	**-896.000**	**-1.136.000**	**-5.680.000**
Ausschüttung in % zum EK	**0,00%**	**0,00%**	**0,00%**	**0,00%**	**0,00%**	**0,00%**	**6,00%**	**6,00%**	**6,00%**	**6,00%**	**6,00%**	**28,00%**	**28,00%**	**28,00%**	**28,00%**	**35,50%**	**177,50%**
Liquiditätsüberschuss	-511.153	-516.877	-493.031	-469.277	-445.622	-220.555	-107.540	-74.961	-42.460	-10.045	427.786	79.056	13.121	-2.384	-18.423	-818.034	-3.210.399
Liquiditätszufluss EK neue Gesellschaft *4	3.200.000																
Liquiditätsreserve vor Verpfändung	**2.704.490**	**2.187.613**	**1.694.582**	**1.225.306**	**779.683**	**559.128**	**451.589**	**376.628**	**334.167**	**324.122**	**751.908**	**830.964**	**844.085**	**841.701**	**823.278**	**5.244**	
Einzahlung auf Rückbaukonto	*60.000*	*60.000*	*60.000*	*60.000*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	240.000
Verpfändung Rückbau (kummuliert)	360.000	420.000	480.000	540.000	540.000	540.000	540.000	540.000	540.000	540.000	540.000	540.000	540.000	540.000	540.000	0	
40 % Kapitaldienst Folgejahr (verpfändet)	738.721	723.400	708.079	692.758	600.442	459.400	440.758	422.117	403.475	166.477	0	0	0	0	0	0	
Liquiditätsreserve nach Verpfändung	**1.605.769**	**1.044.213**	**506.503**	**-7.453**	**-360.759**	**-440.272**	**-529.170**	**-585.489**	**-609.308**	**-382.355**	**211.908**	**290.964**	**304.085**	**301.701**	**283.278**	**5.244**	
Cash Flow	*1.373.951*	*1.329.925*	*1.315.469*	*1.300.921*	*1.286.273*	*1.280.549*	*1.232.960*	*1.218.935*	*1.204.831*	*1.190.642*	*1.035.978*	*975.056*	*909.121*	*893.616*	*877.577*	*317.966*	
Kapitaldienst	*1.885.104*	*1.846.802*	*1.808.500*	*1.770.198*	*1.731.896*	*1.501.104*	*1.148.500*	*1.101.896*	*1.055.292*	*1.008.688*	*416.193*	*0*	*0*	*0*	*0*	*0*	
DSCR	*73%*	*72%*	*73%*	*73%*	*74%*	*85%*	*107%*	*111%*	*114%*	*118%*	*249%*						

Zins- und Tilgungsplan

	5,5	6,5	7,5	8,5	9,5	10,5	11,5	12,5	13,5	14,5	15,5	16,5	17,5	18,5	19,5	20,5	
	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	
Kfw "Erneuerl 4.800.000																	
Laufzeit: 10,00 Jahre Tilgung	600.000	600.000	600.000	600.000	600.000	300.000	0	0	0	0	0	0	0	0	0	0	3.300.000
Tilgungsfrei: 2,00 Jahre Tilgung kum.	2.100.000	2.700.000	3.300.000	3.900.000	4.500.000	4.800.000	4.800.000	4.800.000	4.800.000	4.800.000	4.800.000	4.800.000	4.800.000	4.800.000	4.800.000	4.800.000	
Zinssatz: 2,00 % Zinsen	60.000	48.000	36.000	24.000	12.000	3.000	0	0	0	0	0	0	0	0	0	0	183.000
Kfw "Erneuerl 9.745.000																	
Laufzeit: 15,00 Jahre Tilgung	812.083	812.083	812.083	812.083	812.083	812.083	812.083	812.083	812.083	812.083	406.042	0	0	0	0	0	8.526.875
Tilgungsfrei: 3,00 Jahre Tilgung kum.	2.030.208	2.842.292	3.654.375	4.466.458	5.278.542	6.090.625	6.902.708	7.714.792	8.526.875	9.338.958	9.745.000	9.745.000	9.745.000	9.745.000	9.745.000	9.745.000	
Zinssatz: 2,50 % Zinsen	203.021	182.719	162.417	142.115	121.813	101.510	81.208	60.906	40.604	20.302	5.076	0	0	0	0	0	1.121.690
Bankdarleher 1.500.000 *5	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
Laufzeit: 10,00 Jahre Tilgung	150.000	150.000	150.000	150.000	150.000	150.000	150.000	150.000	150.000	150.000	0	0	0	0	0	0	1.500.000
Tilgungsfrei: 0,00 Jahre Tilgung kum.	150.000	300.000	450.000	600.000	750.000	900.000	1.050.000	1.200.000	1.350.000	1.500.000	1.500.000	1.500.000	1.500.000	1.500.000	1.500.000	1.500.000	
Zinssatz: 4,00 % Zinsen	60.000	54.000	48.000	42.000	36.000	30.000	24.000	18.000	12.000	6.000	0	0	0	0	0	0	330.000

Berechnung der GewSt

	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	
Ergebnis vor Steuer	29.528	31.457	55.262	79.047	102.804	19.015	22.789	57.623	92.487	127.369	-2.959	449.414	887.677	870.262	852.193	860.448	4.534.415
Darlehenszinsen / Disagio 100%	*323.021*	*284.719*	*246.417*	*208.115*	*169.813*	*239.021*	*186.417*	*139.813*	*93.208*	*46.604*	*10.151*	*0*	*0*	*0*	*0*	*0*	
Pachten 50%	*55.454*	*55.454*	*55.454*	*55.454*	*55.454*	*55.454*	*73.563*	*73.563*	*73.563*	*73.563*	*73.563*	*73.563*	*73.563*	*73.563*	*73.563*	*73.563*	
Zwischensumme	*378.475*	*340.173*	*301.871*	*263.568*	*225.266*	*294.475*	*259.980*	*213.376*	*166.772*	*120.168*	*83.715*	*73.563*	*73.563*	*73.563*	*73.563*	*73.563*	
abzüglich Freibetrag 100.000 €	*278.475*	*240.173*	*201.871*	*163.568*	*125.266*	*194.475*	*159.980*	*113.376*	*66.772*	*20.168*	*0*	*0*	*0*	*0*	*0*	*0*	
Hinzurechnung 25%	69.619	60.043	50.468	40.892	31.317	48.619	39.995	28.344	16.693	5.042	0	0	0	0	0	0	
Hinzurechnung Vorlaufkosten	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
gewst. Ergebnis	99.147	91.500	105.729	119.939	134.121	67.633	62.784	85.967	109.180	132.411	-2.959	449.414	887.677	870.262	852.193	860.448	
Verlustvortrag	0	0	0	0	0	0	0	0	0	0	0	-2.959	0	0	0	0	
Verlustfeststellung	99.147	91.500	105.729	119.939	134.121	67.633	62.784	85.967	109.180	132.411	-2.959	446.454	887.677	870.262	852.193	860.448	
./. Freibetrag (24.500)	-24.500	-24.500	-24.500	-24.500	-24.500	-24.500	-24.500	-24.500	-24.500	-24.500	0	-24.500	-24.500	-24.500	-24.500	-24.500	
zu versteuerndes Ergebnis	**74.647**	**67.000**	**81.229**	**95.439**	**109.621**	**43.133**	**38.284**	**61.467**	**84.680**	**107.911**	**-2.959**	**421.954**	**863.177**	**845.762**	**827.693**	**835.948**	**4.554.986**
Hebesatz 320%																	
Gewerbesteuer Messbetrag 3,5%	2.613	2.345	2.843	3.340	3.837	1.510	1.340	2.151	2.964	3.777	0	14.768	30.211	29.602	28.969	29.258	
Gewerbeertragsteuer gesamt	**8.360**	**7.504**	**9.098**	**10.689**	**12.278**	**4.831**	**4.288**	**6.884**	**9.484**	**12.086**	**0**	**47.259**	**96.676**	**94.725**	**92.702**	**93.626**	**510.490**

Abschreibungen

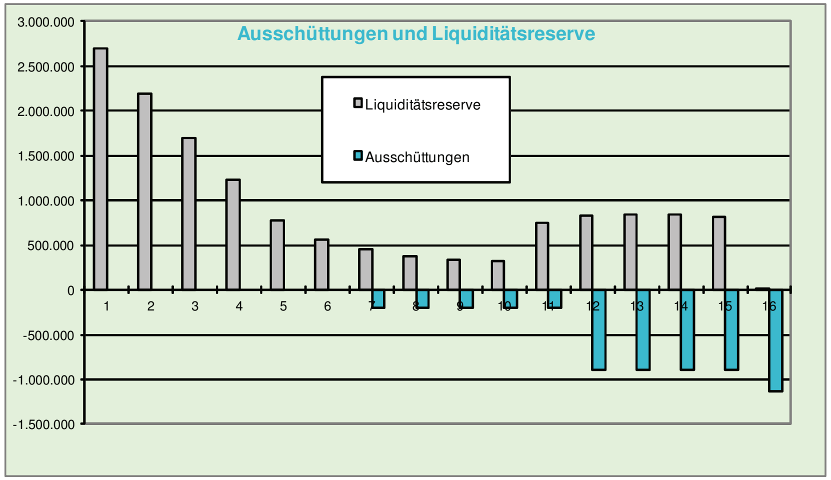
	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	kum.
Sonder-AfA § 7g EStG in %																	
in €																	0
AK (lin) 14.545.000,00 €																	
ND in Jahren **16 Jahre**																	
AfA-Satz 6,25%																	
Abschreibung in Euro	909.063	909.063	909.063	909.063	909.063	909.063	909.063	909.063	909.063	909.063	909.063	454.531					10.454.219
Restbuchwert	9.545.156	8.636.094	7.727.031	6.817.969	5.908.906	4.999.844	4.090.781	3.181.719	2.272.656	1.363.594	454.531	0	0	0	0	0	
AK (lin) *5 1.500.000,00 €																	
ND in Jahren **16 Jahre**																	
AfA-Satz 6,25%																	
Abschreibung in Euro	93.750	93.750	93.750	93.750	93.750	93.750	93.750	93.750	93.750	93.750	93.750	93.750	93.750	93.750	93.750	93.750	1.500.000
Restbuchwert	1.406.250	1.312.500	1.218.750	1.125.000	1.031.250	937.500	843.750	750.000	656.250	562.500	468.750	375.000	281.250	187.500	93.750	0	

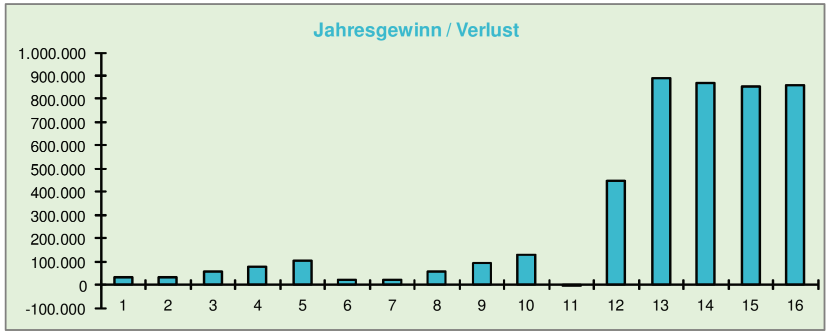
*1 Laut neuen Pachtverträgen max. zu versiegelnde Fläche = 4.000 m² bei 0,25 € pro m². Im Schnitt wird mit 750 € pro WEA gerechnet.
*3 Als Rückstellung sind 60.000 € pro MW vorgesehen. Bei 3 MW per WEA (3) errechnet sich eine Gesamtrückstellung von 540.000 € berechnet auf 20 Jahre.
*4 Der neuen Gesellschaft werden 3.200.000 € EK zugeführt.
*5 WEA werden der WESU Repowering mit einem "Aufgeld" in Höhe von 1.500.000 € abgekauft und finanziert.

Appendix K

Financial Ratios and Diagrams E-101 WP Sustrum Süd

Kennzahlen	in %	in €
Investitionskosten pro kWh		0,73 €
Barausschüttungen kummuliert	177,50%	5.680.000,00 €
Überschuss/Jahr (vor Steuern)	4,84%	





Appendix L

Investment E-101 WP Sustrum Nord

Anzahl WEA	4	1
E 101 inkl. Trafo/Fundament		
Ausgleichsmaßnahmen		
Projektierung		
Zinsen / Bereitstellung / Aval bis IB		
ext./int Verk., Netzanb., Ü-Station		
UW- Erweiterung/Errichtung (Umspannwerk)		
Erschließung / Wegebau		
Sondernutzungsrecht Gemeinde		
Sonstiges (Gutachten/Telefon/Gebühren usw.)		
Verwaltung / Überwachung / GF bis IB		
Kauf von 4 Standortrechten WESU RePow *1	1.200.000,00 €	
Kompensation EEG-Vergütung 2019-2020 für WESU RePow/Original *2	1.265.206,00 €	
Repowering-Ansprüche *3	801.211,33 €	
	22.641.417,33 €	**5.660.354,33 €**

*1 Vier Standortrechte in Höhe von 100.000 € pro MW gekauft von WESU RePow.
Bei 3MW-WEA in Summe 1.200.000 €

*2 EEG Vergütung läuft bis 2020. Zu erwartende Ausschüttungen belaufen sich auf 1.633.117 € (Barwertberechnung 1.265.206 €), dieser Betrag wird von der neuzugründenden Gesellschaft WP Sustrum Nord übernommen. Barwertberechnung zu finden in der Average-Case Prognose WESU Original

*3 Vier Repowering-Ansprüche gekauft von WESU Repowering (siehe Berechnung Registerkarte)

Angebotspreis E-101 3.0 MW NH 135m *4 Stand: 13. Feb 13

Einzelpositionen	Einzelrichtpreis	Angebot
Grundpreis Anlage		
FACTS-Leistungsmerkmale		inkl.
Q+-Option		inkl.
Tageskennzeichnung rot/grau/rot		inkl.
Nachtkennzeichnung W-Rot		inkl.
Turmbefeuerung		inkl.
Mehrpreis NH 149m		
Tiefgründungsfundament mit Pfahllänge bis 20m		
Flachgründungsfundament mit Auftriebsicherung		
Gesamt		

*4 Wir nehmen an, dass die Höhenbegrenzung von 182m über NN in Sustrum entfällt. Stattdessen darf bis 200m über natürlichem Boden gebaut werden (Stand 13.02.2013 laut Rechtanwalt Berghaus). Daher wird eine maximale Turmhöhe von 135m angesetzt (zzgl. Flügelradius von 50,5m).

Appendix M

Investment Plan E-101 WP Sustrum Nord

W n E GmbH
Große Straße 14
26871 Aschendorf

Gesellschaften:		
"WP Sustrum Nord"	Datum der Bearbeitung:	13.02.2013
	Bearbeiter:	S. Jansen
	Gründungsjahr:	2014

Investitionsplan	in %	in Euro	AfA-Zeitraum
E-101 inkl. Trafo / Fundament			
Verwaltung / GF bis IB			
Ausgleichsmaßnahmen			
Standorte / UVP / Bimsch-Gen.			
Zinsen, Bereitstellung, Aval bis IB			
ext./int Verk., Netzanb., Ü-Station			
Erschließung / Wegebau			
Projektentwicklung/Rechtsberatung			
Sondernutzungsrecht Gemeinde			
Sonstiges (Gutachten/Telefon/Gebühren usw.)			
Zwischensumme	**97,17%**	**22.641.417,33 €**	
Liquiditäts- / Kostenreserve	**2,83%**	**658.582,67 €**	**kein Aufwand**
Disagio	**0,0%**	**- €**	**15 Jahre**
Summe Investitionskosten	**100,0%**	**23.300.000,00 €**	

Parkdaten			
Standort	**Sustrum**	Aufstelljahr	**2014**
WKA- Typ	**E-101 3.0 MW**	Inbetriebnahme	**Juli**
Nabenhöhe	**135 m**	Monate im IB-Jahr	**6**
Rotordurchmesser	**101 m**		
Wind in Narbenhöhe			
WEA-Anzahl	**4**		

Finanzierungsplan				
Fremdkapital				
Kfw "Erneuerbare Energie"				
Betrag	**25,75%**	6.000.000,00 €		
Tilgungsfrei		2,0 Jahre		
Zinssatz		2,00 %		
Laufzeit		10 Jahre		
Kfw "Erneuerbare Energie"				
Betrag	**51,07%**	11.900.000,00 €	Disagio	- €
Tilgungsfrei		3,0 Jahre		
Zinssatz		2,50 %		
Laufzeit		15 Jahre		
Euribor				
Betrag	**0,00%**	- €		
Tilgungsfrei		0,0 Jahre		
Zinssatz		2,25 %		
Laufzeit		3 Jahre		
Eigenkapital				
Kommanditisten	**23,18%**	**5.400.000,00 €**		
Summe Finanzierung	**100,00%**	**23.300.000,00 €**		

Laufende Erträge			
Energieprognose (nach Parkwirkung) *1		**32.860.450 kWh**	
abzgl. Parkwirkung *2	5,00%	1.643.023 kWh	**31.217.428 kWh**
abzgl. Verfügbarkeitsabschlag	3,00%	936.523 kWh	30.280.905 kWh
abzgl. Leitungsverluste	2,00%	605.618 kWh	29.675.287 kWh
abzgl. Schatten/Eis	0,00%	0 kWh	29.675.287 kWh
abzgl. Sicherheit	10,00%	3.286.045 kWh	**26.389.242 kWh**
Einspeisevergütung pro KWh *3	für	20 volle Jahre	0,0915 € pro KWh
Einspeisevergütung gesamt			**2.414.615,60 €**
		danach	0,0000 € pro KWh
			- €
Überziehungszinssatz	5,00%		
Kontokorrent Zinssatz für Guthaben	1,00%		

Allgemeine Daten		
Gewerbesteuerhebesatz		320%
Darlehen	anteilig	0,5

Laufender Aufwand		ab 1. volles Jahr		ab 3. volles Jahr		ab 6. volles Jahr		ab 11. volles Jahr	Steig. in %
Strombezug		4.000,00 €		4.243,60 €		4.637,10 €		5.375,67 €	3,00%
EPK		- €		145.140,83 €		316.929,51 €		367.408,17 €	3,00%
Pachtaufwand inkl. Festbetrag	6%	147.876,94 €	6%	147.876,94 €	6%	147.876,94 €	8%	196.169,25 €	10.000 / MW
Verwaltung/Geschäftsf./ techn. Überwachung		120.730,78 €		124.379,87 €		130.061,34 €		140.113,00 €	1,50%
Haftpflichtversicherung		400,00 €		424,36 €		463,71 €		537,57 €	3,00%
Maschinenbruch-/ BU-Vers.		15.600,00 €		16.550,04 €		18.084,68 €		20.965,10 €	3,00%
Komplementärvergütung		2.500,00 €		2.500,00 €		2.500,00 €		2.500,00 €	
Steuerberatung / Jahresbilanz		8.000,00 €		8.487,20 €		9.274,19 €		10.751,33 €	3,00%
Sonstiges		20.000,00 €		20.012,00 €		20.030,02 €		20.060,08 €	3,00%
Zinsaufwand ab Fertigstellung		417.500,00 €		396.302,08 €		283.125,00 €		198.333,33 €	
Überziehungszinsen		- €		- €		- €		- €	
Gewerbesteuer		34.651,87 €		22.423,59 €		11.112,65 €		4.359,77 €	
Avalprovision		4.000,00 €		4.000,00 €		4.000,00 €		4.000,00 €	
Gründungskosten "Afa"		- €		- €		- €		- €	
Disagio		- €		- €		- €		- €	15 Jahre
Rückstellung für Rückbau		36.000,00 €		36.000,00 €		36.000,00 €		36.000,00 €	
Abschreibung		1.415.088,58 €		1.415.088,58 €		1.415.088,58 €		1.415.088,58 €	16 Jahre
Summe Aufwand		**2.226.348,17 €**		**2.343.429,09 €**		**2.399.183,72 €**		**2.421.661,84 €**	

*1 Als Berechnungsgrundlage dient die anemos-Windanalyse für den Windpark Ohne. Wahrscheinlichkeit P75 (75%) 93.886,5 MWh/Jahr für 16 WEA - Umrechnung auf 4 WEA. Die 10 m Differenz in der NH (125 m zu 135 m) werden mit 10 % Mehrertrag kalkuliert. 1 % pro Höhenmeter. Zusätzlich wird durch den besseren Standort in Sustrum ein Mehrertrag von 30 % im Vergleich zu Ohne erwartet. Diese Einschätzung basiert auf einen Ertragsvergleich baugleicher Anlagen (GE 1.5sl) in Ohne und Sustrum.
*2 Im Gegensatz zu Ohne (16 WEA) wird die Parkwirkung im Windpark Sustrum deutlich höher ausfallen. Derzeit besteht der Windpark aus 29 WEA. Daher wird eine zusätzliche Parkwirkung von 5 % einkalkuliert.
*3 Im Jahr 2014 Anfangsvergütung 8,66 €/Cent pro kWh zzgl. 0,49 €/Cent Repowering-Bonus.

Appendix N

Profit and Loss Forecast E-101 WP Sustrum Nord

Ergebnisprognose	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	
	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	kum.
Erträge																						
Einspeisevergütung	1.207.308	2.414.616	2.414.616	2.414.616	2.414.616	2.414.616	2.414.616	2.414.616	2.414.616	2.414.616	2.414.616	2.414.616	2.414.616	2.414.616	2.414.616	2.414.616	2.414.616	2.414.616	2.414.616	2.414.616	2.414.616	49.499.620
Zinserträge	0	13.113	27.976	38.540	39.948	36.650	32.910	28.763	24.847	21.159	17.699	17.008	16.248	15.812	15.696	15.901	19.333	18.398	16.392	14.166	11.714	442.274
Erträge gesamt	**1.207.308**	**2.427.728**	**2.442.592**	**2.453.156**	**2.454.564**	**2.451.266**	**2.447.525**	**2.443.379**	**2.439.463**	**2.435.775**	**2.432.314**	**2.431.624**	**2.430.864**	**2.430.427**	**2.430.312**	**2.430.517**	**2.433.948**	**2.433.014**	**2.431.007**	**2.428.782**	**2.426.329**	**49.941.894**
Aufwendungen																						
Strombezug	2.000	4.000	4.120	4.244	4.371	4.502	4.637	4.776	4.919	5.067	5.219	5.376	5.537	5.703	5.874	6.050	6.232	6.419	6.611	6.810	7.014	109.481
Pachtaufwendungen inkl. Festbetrag *1	73.938	147.877	147.877	147.877	147.877	147.877	147.877	147.877	147.877	147.877	147.877	196.169	196.169	196.169	196.169	196.169	196.169	196.169	196.169	196.169	196.169	3.514.400
EPK *2	0	0	72.570	145.141	149.495	235.455	316.930	326.437	336.231	346.317	356.707	367.408	378.430	389.783	401.477	620.282	638.890	658.057	677.799	698.133	719.076	7.834.618
Versicherungen	8.000	16.000	16.480	16.974	17.484	18.008	18.548	19.105	19.678	20.268	20.876	21.503	22.148	22.812	23.497	24.201	24.927	25.675	26.446	27.239	28.056	437.926
Komplementärvergütung	2.500	2.500	2.500	2.500	2.500	2.500	2.500	2.500	2.500	2.500	2.500	2.500	2.500	2.500	2.500	2.500	2.500	2.500	2.500	2.500	2.500	52.500
Verwaltung/Geschäftsf./ techn. Überwachung	60.365	120.731	122.542	124.380	126.246	128.139	130.061	132.012	133.992	136.002	138.042	140.113	142.215	144.348	146.513	148.711	150.941	153.206	155.504	157.836	160.204	2.852.104
Steuerberatung / Jahresbilanz	8.000	8.000	8.240	8.487	8.742	9.004	9.274	9.552	9.839	10.134	10.438	10.751	11.074	11.406	11.748	12.101	12.464	12.838	13.223	13.619	14.028	222.963
Rückstellung für Rückbau *3	36.000	36.000	36.000	36.000	36.000	36.000	36.000	36.000	36.000	36.000	36.000	36.000	36.000	36.000	36.000	36.000	36.000	36.000	36.000	36.000	0	720.000
Abschreibung	707.544	1.415.089	1.415.089	1.415.089	1.415.089	1.415.089	1.415.089	1.415.089	1.415.089	1.415.089	1.415.089	1.415.089	1.415.089	1.415.089	1.415.089	1.415.089	707.544	0	0	0	0	22.641.417
Sonstiges	10.000	20.000	20.006	20.012	20.018	20.024	20.030	20.036	20.042	20.048	20.054	20.060	20.066	20.072	20.078	20.084	20.090	20.096	20.102	20.108	20.114	411.142
Zinsaufwand ab Fertigstellung	208.750	417.500	413.750	396.302	362.708	322.917	283.125	243.333	203.542	163.750	255.417	198.333	148.750	99.167	49.583	12.396	0	0	0	0	0	3.779.323
Avalprovision	2.000	4.000	4.000	4.000	4.000	4.000	4.000	4.000	4.000	4.000	4.000	4.000	4.000	4.000	4.000	4.000	4.000	4.000	4.000	4.000	4.000	82.000
Aufwendungen vor Gewerbesteuer	**1.119.098**	**2.191.696**	**2.263.174**	**2.321.006**	**2.294.529**	**2.343.514**	**2.388.071**	**2.360.718**	**2.333.709**	**2.307.053**	**2.412.219**	**2.417.302**	**2.381.978**	**2.347.049**	**2.312.528**	**2.497.583**	**1.799.758**	**1.114.960**	**1.138.353**	**1.162.414**	**1.151.162**	**42.657.875**
Gewerbesteuer (siehe Berechnung)	17.061	34.652	28.206	22.424	24.606	17.636	11.113	12.598	14.070	15.528	5.929	4.360	6.843	9.317	11.782	0	61.067	144.878	142.033	139.089	140.075	863.266
Aufwendungen inkl. Gewerbesteuer	1.136.159	2.226.348	2.291.380	2.343.429	2.319.135	2.361.151	2.399.184	2.373.316	2.347.779	2.322.581	2.418.148	2.421.662	2.388.820	2.356.367	2.324.311	2.497.583	1.860.826	1.259.838	1.280.387	1.301.504	1.291.237	43.521.141
Jahresgewinn / Verlust	**88.210**	**236.032**	**179.418**	**132.151**	**160.035**	**107.752**	**59.454**	**82.661**	**105.754**	**128.722**	**20.095**	**14.322**	**48.886**	**83.378**	**117.784**	**-67.066**	**634.190**	**1.318.054**	**1.292.654**	**1.266.367**	**1.275.167**	**7.284.019**

Liquiditätsprognose	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	kum.
Jahresgewinn / Verlust	88.210	236.032	179.418	132.151	160.035	107.752	59.454	82.661	105.754	128.722	20.095	14.322	48.886	83.378	117.784	-67.066	634.190	1.318.054	1.292.654	1.266.367	1.275.167	7.284.019
zzgl. Zuführung Rückstellung	36.000	36.000	36.000	36.000	36.000	36.000	36.000	36.000	36.000	36.000	36.000	36.000	36.000	36.000	36.000	36.000	36.000	36.000	36.000	36.000	0	720.000
zzgl. Abschreibung	707.544	1.415.089	1.415.089	1.415.089	1.415.089	1.415.089	1.415.089	1.415.089	1.415.089	1.415.089	1.415.089	1.415.089	1.415.089	1.415.089	1.415.089	1.415.089	707.544	0	0	0	0	22.641.417
zzgl. "finanzierte" Liquiditätsreserve	658.583																					658.583
abzgl. einbehaltene Zinsabschlagsteuer	0	-4.150	-8.854	-12.198	-12.644	-11.600	-10.416	-9.104	-7.864	-6.697	-5.602	-5.383	-5.143	-5.004	-4.968	-5.033	-6.119	-5.823	-5.188	-4.484	-3.707	-139.980
abzgl. GewSt	-17.061	-34.652	-28.206	-22.424	-24.606	-17.636	-11.113	-12.598	-14.070	-15.528	-5.929	-4.360	-6.843	-9.317	-11.782	0	-61.067	-144.878	-142.033	-139.089	-140.075	-863.266
abzgl. Tilgung	0	0	-375.000	-1.245.833	-1.741.667	-1.741.667	-1.741.667	-1.741.667	-1.741.667	-1.741.667	-1.366.667	-991.667	-991.667	-991.667	-991.667	-495.833	0	0	0	0	0	-17.900.000
abzgl. Rückbaukosten inkl. Sanierung	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-720.000	-720.000
abzgl. Ausschüttungen	**-162.000**	**-162.000**	**-162.000**	**-162.000**	**-162.000**	**-162.000**	**-162.000**	**-162.000**	**-162.000**	**-162.000**	**-162.000**	**-540.000**	**-540.000**	**-540.000**	**-540.000**	**-540.000**	**-1.404.000**	**-1.404.000**	**-1.404.000**	**-1.404.000**	**-1.566.000**	**-11.664.000**
Ausschüttung in % zum EK	**3,00%**	**3,00%**	**3,00%**	**3,00%**	**3,00%**	**3,00%**	**3,00%**	**3,00%**	**3,00%**	**3,00%**	**3,00%**	**10,00%**	**10,00%**	**10,00%**	**10,00%**	**10,00%**	**26,00%**	**26,00%**	**26,00%**	**26,00%**	**29,00%**	**216,00%**
Liquiditätsüberschuss	1.311.276	1.486.319	1.056.446	140.784	-329.793	-374.063	-414.652	-391.618	-368.758	-346.081	-69.013	-75.999	-43.677	-11.522	20.455	343.156	-93.452	-200.647	-222.567	-245.206	-1.154.615	16.773
Liquiditätsreserve vor Verpfändung	**1.311.276**	**2.797.595**	**3.854.041**	**3.994.825**	**3.665.032**	**3.290.969**	**2.876.317**	**2.484.699**	**2.115.940**	**1.769.859**	**1.700.846**	**1.624.847**	**1.581.170**	**1.569.648**	**1.590.104**	**1.933.260**	**1.839.808**	**1.639.161**	**1.416.594**	**1.171.388**	**16.773**	
Einzahlung auf Rückbaukonto	*60.000*	*60.000*	*60.000*	*60.000*	*60.000*	*60.000*	*60.000*	*60.000*	*60.000*	*60.000*	*60.000*	*60.000*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	720.000
Verpfändung Rückbau (kummuliert)	60.000	120.000	180.000	240.000	300.000	360.000	420.000	480.000	540.000	600.000	660.000	720.000	720.000	720.000	720.000	720.000	720.000	720.000	720.000	720.000	0	
40 % Kapitaldienst Folgejahr (verpfändet)	0	0	656.854	841.750	825.833	809.917	794.000	778.083	762.167	648.833	476.000	456.167	436.333	416.500	203.292	0	0	0	0	0	0	
Liquiditätsreserve nach Verpfändung	**1.251.276**	**2.677.595**	**3.017.186**	**2.913.075**	**2.539.199**	**2.121.053**	**1.662.317**	**1.226.615**	**813.774**	**521.026**	**564.846**	**448.680**	**424.837**	**433.148**	**666.812**	**1.213.260**	**1.119.808**	**919.161**	**696.594**	**451.388**	**16.773**	
Cash Flow	*1.682.026*	*2.065.819*	*2.007.196*	*1.944.920*	*1.936.582*	*1.852.521*	*1.772.139*	*1.755.382*	*1.738.450*	*1.721.336*	*1.715.070*	*1.654.001*	*1.636.740*	*1.619.312*	*1.601.705*	*1.391.386*	*1.310.548*	*1.203.353*	*1.181.433*	*1.158.794*	*411.385*	
Kapitaldienst	*208.750*	*417.500*	*788.750*	*1.642.135*	*2.104.375*	*2.064.583*	*2.024.792*	*1.985.000*	*1.945.208*	*1.905.417*	*1.622.083*	*1.190.000*	*1.140.417*	*1.090.833*	*1.041.250*	*508.229*	*0*	*0*	*0*	*0*	*0*	
DSCR *0,00*	*806%*	*495%*	*254%*	*118%*	*92%*	*90%*	*88%*	*88%*	*89%*	*90%*	*106%*	*139%*	*144%*	*148%*	*154%*	*274%*						

Zins- und Tilgungsplan	0,5	1,5	2,5	3,5	4,5	5,5	6,5	7,5	8,5	9,5	10,5	11,5	12,5	13,5	14,5	15,5	16,5	17,5	18,5	19,5	20,5	
	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	
Kfw "Erneuerl 6.000.000																						
Laufzeit: 10,00 Jahre Tilgung	0	0	375.000	750.000	750.000	750.000	750.000	750.000	750.000	750.000	375.000	0	0	0	0	0	0	0	0	0	0	6.000.000
Tilgungsfrei: 2,00 Jahre Tilgung kum.	0	0	375.000	1.125.000	1.875.000	2.625.000	3.375.000	4.125.000	4.875.000	5.625.000	6.000.000	6.000.000	6.000.000	6.000.000	6.000.000	6.000.000	6.000.000	6.000.000	6.000.000	6.000.000	6.000.000	
Zinssatz: 2,00 % Zinsen	60.000	120.000	116.250	105.000	90.000	75.000	60.000	45.000	30.000	15.000	3.750	0	0	0	0	0	0	0	0	0	0	720.000
Kfw "Erneuerl 11.900.000																						
Laufzeit: 15,00 Jahre Tilgung	0	0	0	495.833	991.667	991.667	991.667	991.667	991.667	991.667	991.667	991.667	991.667	991.667	991.667	495.833	0	0	0	0	0	11.900.000
Tilgungsfrei: 3,00 Jahre Tilgung kum.	0	0	0	495.833	1.487.500	2.479.167	3.470.833	4.462.500	5.454.167	6.445.833	7.437.500	8.429.167	9.420.833	10.412.500	11.404.167	11.900.000	11.900.000	11.900.000	11.900.000	11.900.000	11.900.000	
Zinssatz: 2,50 % Zinsen	148.750	297.500	297.500	291.302	272.708	247.917	223.125	198.333	173.542	148.750	123.958	99.167	74.375	49.583	24.792	6.198	0	0	0	0	0	2.677.500

Berechnung der GewSt	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	
Ergebnis vor Steuer	88.210	236.032	179.418	132.151	160.035	107.752	59.454	82.661	105.754	128.722	20.095	14.322	48.886	83.378	117.784	-67.066	634.190	1.318.054	1.292.654	1.266.367	1.275.167	7.284.019
Darlehenszinsen / Disagio 100%	*417.500*	*417.500*	*413.750*	*396.302*	*362.708*	*322.917*	*283.125*	*243.333*	*203.542*	*163.750*	*255.417*	*198.333*	*148.750*	*99.167*	*49.583*	*12.396*	*0*	*0*	*0*	*0*	*0*	
Pachten 50%	*36.969*	*73.938*	*73.938*	*73.938*	*73.938*	*73.938*	*73.938*	*73.938*	*73.938*	*73.938*	*73.938*	*98.085*	*98.085*	*98.085*	*98.085*	*98.085*	*98.085*	*98.085*	*98.085*	*98.085*	*98.085*	
Zwischensumme	*454.469*	*491.438*	*487.688*	*470.241*	*436.647*	*396.855*	*357.063*	*317.272*	*277.480*	*237.688*	*329.355*	*296.418*	*246.835*	*197.251*	*147.668*	*110.480*	*98.085*	*98.085*	*98.085*	*98.085*	*98.085*	
abzüglich Freibetrag 100.000 €	*354.469*	*391.438*	*387.688*	*370.241*	*336.647*	*296.855*	*257.063*	*217.272*	*177.480*	*137.688*	*229.355*	*196.418*	*146.835*	*97.251*	*47.668*	*10.480*	*0*	*0*	0	0	0	
Hinzurechnung 25%	88.617	97.860	96.922	92.560	84.162	74.214	64.266	54.318	44.370	34.422	57.339	49.104	36.709	24.313	11.917	2.620	0	0	0	0	0	
Hinzurechnung Vorlaufkosten	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
gewst. Ergebnis	176.827	333.892	276.340	224.711	244.197	181.965	123.720	136.979	150.124	163.144	77.434	63.426	85.595	107.691	129.701	-64.446	634.190	1.318.054	1.292.654	1.266.367	1.275.167	
Verlustvortrag		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-64.446	0	0	0	0	
Verlustfeststellung	176.827	333.892	276.340	224.711	244.197	181.965	123.720	136.979	150.124	163.144	77.434	63.426	85.595	107.691	129.701	-64.446	569.744	1.318.054	1.292.654	1.266.367	1.275.167	
./. Freibetrag (24.500)	-24.500	-24.500	-24.500	-24.500	-24.500	-24.500	-24.500	-24.500	-24.500	-24.500	-24.500	-24.500	-24.500	-24.500	-24.500	0	-24.500	-24.500	-24.500	-24.500	-24.500	
zu versteuerndes Ergebnis	**152.327**	**309.392**	**251.840**	**200.211**	**219.697**	**157.465**	**99.220**	**112.479**	**125.624**	**138.644**	**52.934**	**38.926**	**61.095**	**83.191**	**105.201**	**-64.446**	**545.244**	**1.293.554**	**1.268.154**	**1.241.867**	**1.250.667**	**7.643.285**
Hebesatz 320%																						
Gewerbesteuer Messbetrag 3,5%	5.331	10.829	8.814	7.007	7.689	5.511	3.473	3.937	4.397	4.853	1.853	1.362	2.138	2.912	3.682	0	19.084	45.274	44.385	43.465	43.773	
Gewerbeertragsteuer gesamt	**17.061**	**34.652**	**28.206**	**22.424**	**24.606**	**17.636**	**11.113**	**12.598**	**14.070**	**15.528**	**5.929**	**4.360**	**6.843**	**9.317**	**11.782**	**0**	**61.067**	**144.878**	**142.033**	**139.089**	**140.075**	**863.266**

Abschreibungen	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	kum.
Sonder-AfA § 7g EStG in %	0,0%	0,0%	0,0%	0,0%	0,0%																	
in €	0	0	0	0	0																	0
AK (lin) 22.641.417,33 €																						
ND in Jahren **16 Jahre**																						
AfA-Satz 6,25%																						
Abschreibung in Euro	707.544	1.415.089	1.415.089	1.415.089	1.415.089	1.415.089	1.415.089	1.415.089	1.415.089	1.415.089	1.415.089	1.415.089	1.415.089	1.415.089	1.415.089	1.415.089	707.544					22.641.417
Restbuchwert	21.933.873	20.518.784	19.103.696	17.688.607	16.273.519	14.858.430	13.443.342	12.028.253	10.613.164	9.198.076	7.782.987	6.367.899	4.952.810	3.537.721	2.122.633	707.544	0	0	0	0	0	

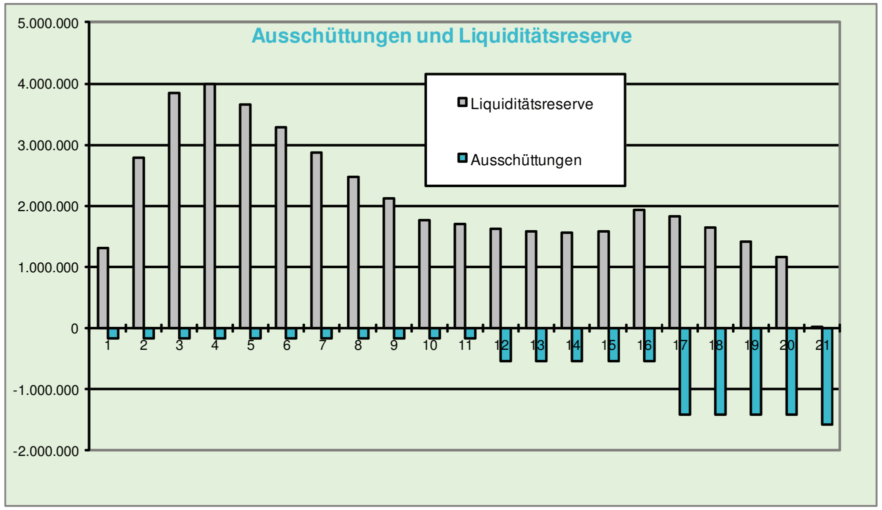
*1 Laut neuen Pachtverträgen max. zu versiegelnde Fläche = 4.000 m² bei 0,25 € pro m². Im Schnitt wird mit 750 € pro WEA gerechnet

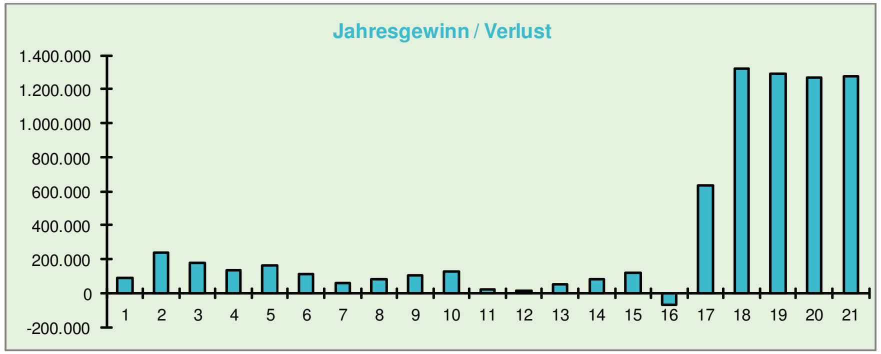
*3 Als Rückstellung sind 60.000 € pro MW vorgesehen. Bei 3 MW per WEA (4) errechnet sich eine Gesamtrückstellung von 720.000 € berechnet auf 20 Jahre

Appendix O

Financial Ratios and Diagrams E-101 WP Sustrum Nord

Kennzahlen	in %	in €
Investitionskosten pro kWh		0,88 €
Barausschüttungen kummuliert	216,00%	11.664.000,00 €
Überschuss/Jahr (vor Steuern)	5,80%	





Appendix P

Investment GE 2.5 WESU Repowering and WP Sustrum Süd

Anzahl WEA	**3**	**1**
GE 2.5-120 inkl. Trafo/Fundament		
Ausgleichsmaßnahmen		
Projektierung		
Zinsen / Bereitstellung / Aval bis IB		
ext./int Verk., Netzanb., Ü-Station		
UW- Erweiterung/Errichtung		
Erschließung / Wegebau		
Sondernutzungsrecht Gemeinde		
Sonstiges (Gutachten/Telefon/Gebühren usw.)		
Verwaltung / Überwachung / GF bis IB		
	13.465.000,00 €	**4.488.333,33 €**

Angebotspreis GE 2.5-120 NH 139m * Stand: 13. Feb 13

Einzelpositionen	**Einzelrichtpreis**	**Angebot**
Grundpreis Anlage	-	
FACTS-Leistungsmerkmale	-	inkl.
Q+-Option	-	inkl.
Tageskennzeichnung rot/grau/rot	-	inkl.
Nachtkennzeichnung W-Rot	-	inkl.
Turmbefeuerung	-	inkl.
Tiefgründungsfundament mit Pfahllänge bis 20m	-	
Flachgründungsfundament mit Auftriebsicherung	-	
Gesamt		

* Wir nehmen an, dass die Höhenbegrenzung von 182m über NN in Sustrum entfällt. Stattdessen darf bis 200m über natürlichem Boden gebaut werden (Stand 13.02.2013 laut Rechtanwalt Berghaus). Daher wird eine maximale Turmhöhe von 139m angesetzt (zzgl. Flügelradius von 60m).

Appendix Q

Investment Plan GE 2.5 WESU Repowering

W n E GmbH
Große Straße 14
26871 Aschendorf

Gesellschaften:

"WESU Repowering"		Datum der Bearbeitung:	13.02.2013
		Bearbeiter:	S. Jansen
		Gründungsjahr:	2014

Investitionsplan

Investitionsplan	in %	in Euro	AfA-Zeitraum
GE 2.5-120 inkl. Trafo / Fundament			
Verwaltung / GF bis IB			
Ausgleichsmaßnahmen			
Standorte / UVP / Bimsch-Gen.			
Zinsen, Bereitstellung, Aval bis IB			
ext./int Verk., Netzanb., Ü-Station			
Erschließung / Wegebau			
Projektentwicklung/Rechtsberatung			
Sondernutzungsrecht Gemeinde			
Sonstiges (Gutachten/Telefon/Gebühren usw.)			
Zwischensumme	**100,00%**	**13.465.000,00 €**	
Liquiditäts- / Kostenreserve	**0,00%**	**- €**	**kein Aufwand**
Disagio	**0,0%**	**- €**	**15 Jahre**
Summe Investitionskosten	**100,0%**	**13.465.000,00 €**	

Parkdaten

Standort	**Sustrum**	Aufstelljahr	**2014**
WKA- Typ	**GE 2.5-120**	Inbetriebnahme	**Juli**
Nabenhöhe	**139 m**	Monate im IB-Jahr	**6**
Rotordurchmesser	**120 m**		
Wind in Narbenhöhe			
WEA-Anzahl	**3**		

Finanzierungsplan

Fremdkapital				
Kfw "Erneuerbare Energie"				
Betrag	**35,65%**	4.800.000,00 €		
Tilgungsfrei		2,0 Jahre		
Zinssatz		2,00 %		
Laufzeit		10 Jahre		
Kfw "Erneuerbare Energie"				
Betrag	**64,35%**	8.665.000,00 €	Disagio	- €
Tilgungsfrei		3,0 Jahre		
Zinssatz		2,50 %		
Laufzeit		15 Jahre		
Euribor				
Betrag	**0,00%**	- €		
Tilgungsfrei		0,0 Jahre		
Zinssatz		2,25 %		
Laufzeit		3 Jahre		
Eigenkapital				
Kommanditisten / WESU Original *1	**0,00%**	**6.281.220,76 €**		
Summe Finanzierung	**100,00%**	**13.465.000,00 €**		

Laufende Erträge

Energieprognose (nach Parkwirkung) *2		**30.293.345 kWh**	
abzgl. Parkwirkung *3	5,00%	1.514.667 kWh	**28.778.677 kWh**
abzgl. Verfügbarkeitsabschlag	3,00%	863.360 kWh	27.915.317 kWh
abzgl. Leitungsverluste	2,00%	558.306 kWh	27.357.011 kWh
abzgl. Schatten/Eis	0,00%	0 kWh	27.357.011 kWh
abzgl. Sicherheit	10,00%	3.029.334 kWh	**24.327.676 kWh**
Einspeisevergütung pro KWh *4	für	20 volle Jahre	0,0866 € pro KWh
Einspeisevergütung gesamt			**2.106.776,76 €**
		danach	0,0000 € pro KWh
			- €
Überziehungszinssatz	5,00%		
Kontokorrent Zinssatz für Guthaben	1,00%		

Allgemeine Daten

Gewerbesteuerhebesatz		320%
Darlehen	anteilig	0,5

Laufender Aufwand

Laufender Aufwand	ab 1. volles Jahr	ab 3. volles Jahr	ab 6. volles Jahr	ab 11. volles Jahr	Steig. in %
Strombezug	3.000,00 €	3.182,70 €	3.477,82 €	4.031,75 €	3,00%
Vollabsicherung GE	219.000,00 €	232.337,10 €	253.881,02 €	294.317,69 €	3,00%
Pachtaufwand inkl. Festbetrag	6% 128.656,61 €	6% 128.656,61 €	6% 128.656,61 €	8% 170.792,14 €	
Verwaltung/Geschäftsf./ techn. Überwachung	105.338,84 €	108.522,70 €	113.479,85 €	122.250,02 €	1,50%
Haftpflichtversicherung	300,00 €	318,27 €	347,78 €	403,17 €	3,00%
Maschinenbruch-/ BU-Vers.	11.700,00 €	12.412,53 €	13.563,51 €	15.723,82 €	3,00%
Komplementärvergütung	2.500,00 €	2.500,00 €	2.500,00 €	2.500,00 €	
Steuerberatung / Jahresbilanz	6.000,00 €	6.365,40 €	6.955,64 €	8.063,50 €	3,00%
Sonstiges	15.000,00 €	15.009,00 €	15.022,51 €	15.045,06 €	3,00%
Zinsaufwand ab Fertigstellung	312.625,00 €	296.111,98 €	210.468,75 €	144.416,67 €	
Überziehungszinsen	- €	- €	162.910,29 €	323.384,10 €	
Gewerbesteuer	55.780,49 €	54.124,52 €	38.824,77 €	16.322,83 €	
Avalprovision	4.000,00 €	4.000,00 €	4.000,00 €	4.000,00 €	
Gründungskosten "Afa"	- €	- €	- €	- €	
Disagio	- €	- €	- €	- €	15 Jahre
Rückstellung für Rückbau	22.500,00 €	22.500,00 €	22.500,00 €	22.500,00 €	
Abschreibung	841.562,50 €	841.562,50 €	841.562,50 €	841.562,50 €	16 Jahre
Summe Aufwand	**1.727.963,43 €**	**1.727.603,31 €**	**1.818.151,06 €**	**1.985.313,25 €**	

*1 bei Gründung WESU 12.285.000 DM, somit 6.281.220 €.
*2 Als Berechnungsgrundlage dient die anemos-Windanalyse für den Windpark Ohne. Wahrscheinlichkeit P75 (75%) 101.612,9 MWh/Jahr für 16 WEA - Umrechnung auf 3 WEA. Die 29 m Differenz in der NH (110 m zu 139 m) werden mit 29 % Mehrertrag kalkuliert. 1 % pro Höhenmeter.
Zusätzlich wird durch den besseren Standort in Sustrum ein Mehrertrag von 30 % im Vergleich zu Ohne erwartet. Diese Einschätzung basiert auf einen Ertragsvergleich baugleicher Anlagen (GE 1.5sl) in Ohne und Sustrum.
*3 Im Gegensatz zu Ohne (16 WEA) wird die Parkwirkung im Windpark Sustrum deutlich höher ausfallen. Derzeit besteht der Windpark aus 29 WEA. Daher wird eine zusätzliche Parkwirkung von 5 % einkalkuliert.
*4 Im Jahr 2014 Anfangsvergütung 8,66 €/Cent pro kWh ohne 0,49 €/Cent Repowering-Bonus.

Appendix R

Investment Plan GE 2.5 WP Sustrum Süd

WINDPARK NÖRDLICHES EMSLAND GMBH

W n E GmbH
Große Straße 14
26871 Aschendorf

Gesellschaften:		
"WP Sustrum Süd"	Datum der Bearbeitung:	13.02.2013
Übernahme WESU Repowering	Bearbeiter:	S. Jansen
in 2019	Gründungsjahr:	2014

Investitionsplan ab 2014	in %	in Euro	AfA-Zeitraum
GE 2.5-120 inkl. Trafo / Fundament			
Verwaltung / GF bis IB			
Ausgleichsmaßnahmen			
Standorte / UVP / Bimsch-Gen.			
Zinsen, Bereitstellung, Aval bis IB			
ext./int Verk., Netzanb., Ü-Station			
Erschließung / Wegebau			
Projektentwicklung/Rechtsberatung			
Sondernutzungsrecht Gemeinde			
Sonstiges (Gutachten/Telefon/Gebühren usw.)			
Zwischensumme	100,0%	13.465.000,00 €	
Liquiditäts- / Kostenreserve	0,0%	- €	kein Aufwand
Disagio	0,0%	- €	15 Jahre
Summe Investitionskosten	100,0%	13.465.000,00 €	

Parkdaten			
Standort	Sustrum	Aufstelljahr	2019
WKA- Typ	GE 2.5-120	Inbetriebnahme	Januar
Nabenhöhe	139 m	Monate im IB-Jahr 2014	6
Rotordurchmesser	120 m		
Wind in Narbenhöhe			
WEA-Anzahl	3		

Finanzierungsplan				
Fremdkapital				
Kfw "Erneuerbare Energie"				
Betrag	35,65%	4.800.000,00 €		
Tilgungsfrei		2,0 Jahre		
Zinssatz		2,00 %		
Laufzeit		10 Jahre		
Kfw "Erneuerbare Energie"				
Betrag	64,35%	8.665.000,00 €	Disagio	- €
Tilgungsfrei		3,0 Jahre		
Zinssatz		2,50 %		
Laufzeit		15 Jahre		
Bankdarlehen				
Betrag	0,00%	1.500.000,00 €		
Tilgungsfrei		0,0 Jahre		
Zinssatz		4,00 %		
Laufzeit		10 Jahre		
Eigenkapital				
Kommanditisten / Neu 2019 *1	22,28%	3.000.000,00 €		
Summe Finanzierung	100,00%	13.465.000,00 €		

Laufende Erträge			
Energieprognose (nach Parkwirkung) *2		**30.293.345 kWh**	
abzgl. Parkwirkung *3	5,00%	1.514.667 kWh	**28.778.677 kWh**
abzgl. Verfügbarkeitsabschlag	3,00%	863.360 kWh	27.915.317 kWh
abzgl. Leitungsverluste	2,00%	558.306 kWh	27.357.011 kWh
abzgl. Schatten/Eis	0,00%	0 kWh	27.357.011 kWh
abzgl. Sicherheit	10,00%	3.029.334 kWh	**24.327.676 kWh**
Einspeisevergütung pro KWh *4	für	20 volle Jahre	0,0866 € pro KWh
Einspeisevergütung gesamt			**2.106.776,76 €**
		danach	0,0000 € pro KWh
			- €
Überziehungszinssatz	5,00%		
Kontokorrent Zinssatz für Guthaben	1,00%		

Allgemeine Daten		
Gewerbesteuerhebesatz		320%
Darlehen	anteilig	0,5

Laufender Aufwand	ab 1. volles Jahr	ab 3. volles Jahr	ab 6. volles Jahr	ab 11. volles Jahr	Steig. in %
Strombezug	3.376,53 €	3.582,16 €	3.914,32 €	4.537,77 €	3,00%
Vollabsicherung GE	246.486,43 €	261.497,45 €	285.745,33 €	496.885,72 €	3,00%
Pachtaufwand inkl. Festbetrag	6% 128.656,61 €	6% 128.656,61 €	6% 128.656,61 €	8% 170.792,14 €	
Verwaltung/Geschäftsf./ techn. Überwachung	111.802,80 €	115.182,04 €	120.443,37 €	129.751,72 €	1,50%
Haftpflichtversicherung	337,65 €	358,22 €	391,43 €	453,78 €	3,00%
Maschinenbruch-/ BU-Vers.	13.168,45 €	13.970,41 €	15.265,85 €	17.697,30 €	3,00%
Komplementärvergütung	2.500,00 €	2.500,00 €	2.500,00 €	2.500,00 €	
Steuerberatung / Jahresbilanz	6.753,05 €	7.164,31 €	7.828,64 €	9.075,54 €	3,00%
Sonstiges	15.018,01 €	15.027,02 €	15.040,55 €	15.063,12 €	3,00%
Zinsaufwand ab Fertigstellung	300.520,83 €	228.416,67 €	216.520,83 €	9.026,04 €	
Überziehungszinsen					
Gewerbesteuer	40.121,79 €	46.491,62 €	42.900,38 €	30.725,32 €	
Abschreibung nachträgl. Investitionskosten	93.750,00 €	93.750,00 €	93.750,00 €	93.750,00 €	
Avalprovision	4.000,00 €	4.000,00 €	4.000,00 €	4.000,00 €	
Gründungskosten "Afa"	- €	- €	- €	- €	
Disagio	- €	- €	- €	- €	15 Jahre
Rückstellung für Rückbau	22.500,00 €	22.500,00 €	22.500,00 €	22.500,00 €	
Abschreibung	841.562,50 €	841.562,50 €	841.562,50 €	841.562,50 €	16 Jahre *5
Summe Aufwand	**1.830.554,65 €**	**1.784.659,01 €**	**1.801.019,80 €**	**1.848.320,95 €**	

*1 bei Gründung WESU 12.285.000 DM, somit 6.281.220 €. Ab 2019 neue Gesellschaft mit EK 3.200.000 €. Das Bankdarlehen in Höhe von 1.500.000,00 € wird zu 100 % finanziert, kein EK- Anteil dafür vorgesehen.
*2 Als Berechnungsgrundlage dient die anemos-Windanalyse für den Windpark Ohne. Wahrscheinlichkeit P75 (75%) 101.612,9 MWh/Jahr für 16 WEA - Umrechnung auf 3 WEA. Die 29 m Differenz in der NH (110 m zu 139 m) werden mit 29 % Mehrertrag kalkuliert. 1 % pro Höhenmeter. Zusätzlich wird durch den besseren Standort in Sustrum ein Mehrertrag von 30 % im Vergleich zu Ohne erwartet. Diese Einschätzung basiert auf einen Ertragsvergleich baugleicher Anlagen (GE 1.5sl) in Ohne und Sustrum.
*3 Im Gegensatz zu Ohne (16 WEA) wird die Parkwirkung im Windpark Sustrum deutlich höher ausfallen. Derzeit besteht der Windpark aus 29 WEA. Daher wird eine zusätzliche Parkwirkung von 5 % einkalkuliert.
*4 Im Jahr 2014 Anfangsvergütung 8,66 €/Cent pro kWh ohne 0,49 €/Cent Repowering-Bonus.
*5 Basis ab 2014 bis 2030.

Appendix S

Profit and Loss Forecast WESU Repowering GE 2.5

Ergebnisprognose	1	2	3	4	5	
	2014	2015	2016	2017	2018	kum.
Erträge						
Einspeisevergütung	1.053.388	2.106.777	2.106.777	2.106.777	2.106.777	9.480.495
Zinserträge	5.000	20.521	20.526	17.480	7.850	71.376
Verkauf Standortrechte *1	1.000.000					1.000.000
Verkauf WEA Dörpen *2	625.000					625.000
Kompensation EEG-Vergütung 2019-2020 *3	1.265.206					
Überschuss aus Verkauf *4					1.500.000	
Erträge gesamt	**3.948.594**	**2.127.298**	**2.127.302**	**2.124.256**	**3.614.626**	**13.942.078**
Aufwendungen						
Strombezug	1.500	3.000	3.090	3.183	3.278	14.051
Pachtaufwendungen inkl. Festbetrag *5	64.328	128.657	128.657	128.657	128.657	578.955
Vollabsicherung GE *6	109.500	219.000	225.570	232.337	239.307	1.025.714
Versicherungen	6.000	12.000	12.360	12.731	13.113	56.204
Komplementärvergütung	2.500	2.500	2.500	2.500	2.500	12.500
Verwaltung/Geschäftsf./ techn. Überwachung	52.669	105.339	106.919	108.523	110.151	483.600
Steuerberatung / Jahresbilanz	6.000	6.000	6.180	6.365	6.556	31.102
Rückstellung für Rückbau *7	22.500	22.500	22.500	22.500	22.500	112.500
Abschreibung	420.781	841.563	841.563	841.563	841.563	3.787.031
Sonstiges	7.500	15.000	15.005	15.009	15.014	67.527
Zinsaufwand ab Fertigstellung	156.313	312.625	309.625	296.112	270.573	1.345.247
Avalprovision	2.000	4.000	4.000	4.000	4.000	18.000
Aufwendungen vor Gewerbesteuer	**851.591**	**1.672.183**	**1.677.968**	**1.673.479**	**1.657.211**	**7.532.431**
Gewerbesteuer (siehe Berechnung)	350.974	55.984	55.252	55.035	223.064	740.309
Aufwendungen inkl. Gewerbesteuer	1.202.566	1.728.167	1.733.220	1.728.514	1.880.274	8.272.741
Jahresgewinn / Verlust	**3.097.003**	**455.115**	**449.335**	**450.778**	**1.957.416**	**6.409.646**

Liquiditätsprognose						
Jahresgewinn / Verlust	3.097.003	455.115	449.335	450.778	1.957.416	6.409.646
zzgl. Zuführung Rückstellung	22.500	22.500	22.500	22.500	22.500	112.500
zzgl. Abschreibung	420.781	841.563	841.563	841.563	841.563	3.787.031
abzgl. einbehaltene Zinsabschlagsteuer	-1.583	-6.495	-6.496	-5.532	-2.484	-22.591
abzgl. GewSt	-350.974	-55.984	-55.252	-55.035	-223.064	-740.309
abzgl. Tilgung	0	0	-300.000	-961.042	-1.322.083	-2.583.125
abzgl. Ausschüttungen	**-1.570.305**	**0**	**0**	**0**	**-785.153**	**-2.355.458**
Prognostizierte Ausschüttung WESU Original	**-565.310**	**-1.256.244**	**-1.256.244**	**-1.256.244**	**-1.256.244**	**-5.590.286**
Ausschüttung in % zum EK	**25,00%**	**0,00%**	**0,00%**	**0,00%**	**12,50%**	**37,50%**
Ausschüttung in % zum EK WESU Original	**9,00%**	**20,00%**	**20,00%**	**20,00%**	**20,00%**	**89,00%**
Liquiditätsüberschuss	1.052.112	455	-304.595	-963.013	-767.550	-982.592
Liquiditätsreserve per 01.07. *8	1.000.000					1.000.000
Liquiditätsreserve vor Verpfändung	**2.052.112**	**2.052.567**	**1.747.972**	**784.958**	**17.408**	**6.655.017**
Einzahlung auf Rückbaukonto	*45.000*	*45.000*	*45.000*	*45.000*	*45.000*	225.000
Verpfändung Rückbau (kummuliert)	45.000	90.000	135.000	180.000	225.000	
40 % Kapitaldienst Folgejahr (verpfändet)	0	0	502.861	637.063	625.042	
Liquiditätsreserve nach Verpfändung	**2.007.112**	**1.962.567**	**1.110.110**	**-32.104**	**-832.633**	**4.215.052**
Cash Flow	*2.778.730*	*313.080*	*305.030*	*294.140*	*1.610.259*	
Kapitaldienst	*156.313*	*312.625*	*609.625*	*1.257.154*	*1.592.656*	
DSCR	*1778%*	*100%*	*50%*	*23%*	*101%*	

Zins- und Tilgungsplan			0,5	1,5	2,5	3,5	4,5	
			2014	2015	2016	2017	2018	
Kfw "Erneuerl	**4.800.000**							
Laufzeit:	10,00 Jahre	Tilgung	0	0	300.000	600.000	600.000	1.500.000
Tilgungsfrei:	2,00 Jahre	Tilgung kum.	0	0	300.000	900.000	1.500.000	
Zinssatz:	2,00 %	Zinsen	48.000	96.000	93.000	84.000	72.000	393.000
Kfw "Erneuerl	**8.665.000**							
Laufzeit:	15,00 Jahre	Tilgung	0	0	0	361.042	722.083	1.083.125
Tilgungsfrei:	3,00 Jahre	Tilgung kum.	0	0	0	361.042	1.083.125	
Zinssatz:	2,50 %	Zinsen	108.313	216.625	216.625	212.112	198.573	952.247

Berechnung der GewSt							
		2014	2015	2016	2017	2018	
Ergebnis vor Steuer		3.097.003	455.115	449.335	450.778	1.957.416	6.409.646
Darlehenszinsen / Disagio	*100%*	*312.625*	*312.625*	*309.625*	*296.112*	*270.573*	
Pachten	*50%*	*32.164*	*64.328*	*64.328*	*64.328*	*64.328*	
Zwischensumme		*344.789*	*376.953*	*373.953*	*360.440*	*334.901*	
abzüglich Freibetrag 100.000 €		*244.789*	*276.953*	*273.953*	*260.440*	*234.901*	
Hinzurechnung	25%	61.197	69.238	68.488	65.110	58.725	
Hinzurechnung Vorlaufkosten		0	0	0	0	0	
gewst. Ergebnis		3.158.200	524.353	517.823	515.888	2.016.141	
Verlustvortrag			0	0	0	0	
Verlustfeststellung		3.158.200	524.353	517.823	515.888	2.016.141	
./. Freibetrag (24.500)		-24.500	-24.500	-24.500	-24.500	-24.500	
zu versteuerndes Ergebnis		**3.133.700**	**499.853**	**493.323**	**491.388**	**1.991.641**	**6.609.906**
Hebesatz	320%						
Gewerbesteuer Messbetrag	3,5%	109.680	17.495	17.266	17.199	69.707	
Gewerbeertragsteuer gesamt		**350.974**	**55.984**	**55.252**	**55.035**	**223.064**	**740.309**

Abschreibungen		0	1	2	3	4	
		2014	2015	2016	2017	2018	kum.
Sonder-AfA	§ 7g EStG in %	0,0%	0,0%	0,0%	0,0%	0,0%	
	in €	0	0	0	0	0	0
AK (lin)	13.465.000,00 €						
ND in Jahren	**16 Jahre**						
AfA-Satz	6,25%						
Abschreibung in Euro		420.781	841.563	841.563	841.563	841.563	3.787.031
Restbuchwert		13.044.219	12.202.656	11.361.094	10.519.531	9.677.969	

*1 Vier Standortrechte in Höhe von 100.000 € pro MW verkauft an neue Gesellschaft "WP Sustrum Nord". Bei 2,5 MW WEA in Summe 1.000.000 €.
*2 Im Zuge des Repowering wurde die WEA Dörpen von WESU Original verkauft. Erlös gemäß Anteil WESU/WISTRO 10/16 von 1.000.000 €.
*3 EEG Vergütung läuft bis 2020. Zu erwartende Ausschüttungen belaufen sich auf 1.633.117 € (Barwertberechnung 1.265.206 €), dieser Betrag wird von der neuzugründenden Gesellschaft WP Sustrum Nord übernommen.
*4 Verkauf der Maschinen und Rechte an "WP Sustrum Süd": 500.000 € pro WEA.
*5 Laut neuen Pachtverträgen max. zu versiegelnde Fläche = 4.000 m² bei 0,25 € pro m². Im Schnitt wird mit 750 € pro WEA gerechnet.
*7 Als Rückstellung sind 60.000 € pro MW vorgesehen. Bei 2,5 MW per WEA (3) errechnet sich eine Gesamtrückstellung von 450.000 € berechnet auf 20 Jahre.
*8 Stand der Liquiditätsreserve von WESU Original Mitte 2014 (siehe Average Case Szenario)

Appendix T

Profit and Loss Forecast WP Sustrum Süd GE 2.5

"WP Sustrum Süd"

Ergebnisprognose

Ergebnisprognose	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	kum.
Erträge																	
Einspeisevergütung	2.106.777	2.106.777	2.106.777	2.106.777	2.106.777	2.106.777	2.106.777	2.106.777	2.106.777	2.106.777	2.106.777	2.106.777	2.106.777	2.106.777	2.106.777	2.106.777	33.708.428
Zinserträge	174	26.295	22.808	19.542	16.497	13.669	10.178	9.627	9.357	9.366	9.652	6.870	7.134	6.765	6.227	5.513	179.674
Erträge gesamt	**2.106.951**	**2.133.072**	**2.129.585**	**2.126.319**	**2.123.273**	**2.120.446**	**2.116.955**	**2.116.404**	**2.116.134**	**2.116.142**	**2.116.429**	**2.113.647**	**2.113.911**	**2.113.542**	**2.113.003**	**2.112.290**	**33.888.102**
Aufwendungen																	
Strombezug	3.377	3.478	3.582	3.690	3.800	3.914	4.032	4.153	4.277	4.406	4.538	4.674	4.814	4.959	5.107	5.261	68.060
Pachtaufwendungen inkl. Festbetrag *1	128.657	128.657	128.657	128.657	128.657	128.657	170.792	170.792	170.792	170.792	170.792	170.792	170.792	170.792	170.792	170.792	2.479.861
Vollabsicherung GE *2	246.486	253.881	261.497	269.342	277.423	285.745	294.318	303.147	312.242	321.609	496.886	511.792	527.146	542.960	559.249	576.027	6.039.751
Versicherungen	13.506	13.911	14.329	14.758	15.201	15.657	16.127	16.611	17.109	17.622	18.151	18.696	19.256	19.834	20.429	21.042	272.241
Komplementärvergütung	2.500	2.500	2.500	2.500	2.500	2.500	2.500	2.500	2.500	2.500	2.500	2.500	2.500	2.500	2.500	2.500	40.000
Verwaltung/Geschäftsf./ techn. Überwachung	111.803	113.480	115.182	116.910	118.663	120.443	122.250	124.084	125.945	127.834	129.752	131.698	133.673	135.679	137.714	139.779	2.004.889
Steuerberatung / Jahresbilanz	6.753	6.956	7.164	7.379	7.601	7.829	8.063	8.305	8.555	8.811	9.076	9.348	9.628	9.917	10.215	10.521	136.120
Rückstellung für Rückbau *3	22.500	22.500	22.500	22.500	22.500	22.500	22.500	22.500	22.500	22.500	22.500	22.500	22.500	22.500	22.500	0	337.500
Abschreibung	841.563	841.563	841.563	841.563	841.563	841.563	841.563	841.563	841.563	841.563	841.563	420.781	0	0	0	0	9.677.969
Abschreibung nachträgliche Investitionskosten	93.750	93.750	93.750	93.750	93.750	93.750	93.750	93.750	93.750	93.750	93.750	93.750	93.750	93.750	93.750	93.750	1.500.000
Sonstiges	15.018	15.023	15.027	15.032	15.036	15.041	15.045	15.050	15.054	15.059	15.063	15.068	15.072	15.077	15.081	15.086	240.830
Zinsaufwand ab Fertigstellung	300.521	264.469	228.417	192.365	156.313	216.521	168.417	126.313	84.208	42.104	9.026	0	0	0	0	0	1.788.672
Avalprovision	4.000	4.000	4.000	4.000	4.000	4.000	4.000	4.000	4.000	4.000	4.000	4.000	4.000	4.000	4.000	4.000	64.000
Aufwendungen vor Gewerbesteuer	**1.790.433**	**1.764.166**	**1.738.167**	**1.712.445**	**1.687.006**	**1.758.119**	**1.763.356**	**1.732.767**	**1.702.495**	**1.672.550**	**1.817.596**	**1.405.599**	**1.003.133**	**1.021.968**	**1.041.337**	**1.038.758**	**24.649.893**
Gewerbesteuer (siehe Berechnung)	40.122	44.980	46.492	47.997	49.496	42.900	41.166	43.351	45.532	47.708	30.725	76.557	121.663	119.512	117.283	117.492	1.032.977
Aufwendungen inkl. Gewerbesteuer	1.830.555	1.809.146	1.784.659	1.760.442	1.736.502	1.801.020	1.804.522	1.776.118	1.748.027	1.720.258	1.848.321	1.482.156	1.124.796	1.141.480	1.158.620	1.156.249	25.682.870
Jahresgewinn / Verlust	**316.518**	**368.906**	**391.417**	**413.875**	**436.268**	**362.327**	**353.598**	**383.637**	**413.639**	**443.593**	**298.833**	**708.048**	**1.110.778**	**1.091.574**	**1.071.666**	**1.073.532**	**9.238.209**

Liquiditätsprognose

Liquiditätsprognose	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	kum.
Jahresgewinn / Verlust	316.518	368.906	391.417	413.875	436.268	362.327	353.598	383.637	413.639	443.593	298.833	708.048	1.110.778	1.091.574	1.071.666	1.073.532	9.238.209
zzgl. Zuführung Rückstellung	22.500	22.500	22.500	22.500	22.500	22.500	22.500	22.500	22.500	22.500	22.500	22.500	22.500	22.500	22.500	0	337.500
zzgl. Abschreibung	841.563	841.563	841.563	841.563	841.563	841.563	841.563	841.563	841.563	841.563	841.563	420.781	0	0	0	0	9.677.969
zzgl. Abschreibung nachträgliche Investitionskosten	93.750	93.750	93.750	93.750	93.750	93.750	93.750	93.750	93.750	93.750	93.750	93.750	93.750	93.750	93.750	93.750	1.500.000
abzgl. einbehaltene Zinsabschlagsteuer	-55	-8.322	-7.219	-6.185	-5.221	-4.326	-3.221	-3.047	-2.961	-2.964	-3.055	-2.174	-2.258	-2.141	-1.971	-1.745	-56.867
abzgl. GewSt	-40.122	-44.980	-46.492	-47.997	-49.496	-42.900	-41.166	-43.351	-45.532	-47.708	-30.725	-76.557	-121.663	-119.512	-117.283	-117.492	-1.032.977
abzgl. Tilgung	-1.472.083	-1.472.083	-1.472.083	-1.472.083	-1.472.083	-1.172.083	-872.083	-872.083	-872.083	-872.083	-361.042	0	0	0	0	0	-12.381.875
abzgl. Rückbaukosten inkl. Sanierung	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-450.000	-450.000
abzgl. Ausschüttungen	**-150.000**	**-150.000**	**-150.000**	**-150.000**	**-150.000**	**-450.000**	**-450.000**	**-450.000**	**-450.000**	**-450.000**	**-1.140.000**	**-1.140.000**	**-1.140.000**	**-1.140.000**	**-1.140.000**	**-1.140.000**	**-9.840.000**
Ausschüttung in % zum EK	**5,00%**	**5,00%**	**5,00%**	**5,00%**	**5,00%**	**15,00%**	**15,00%**	**15,00%**	**15,00%**	**15,00%**	**38,00%**	**38,00%**	**38,00%**	**38,00%**	**38,00%**	**38,00%**	**328,00%**
Liquiditätsüberschuss	-387.930	-348.667	-326.564	-304.579	-282.720	-349.171	-55.060	-27.032	874	28.649	-278.176	26.348	-36.893	-53.829	-71.337	-541.954	-3.008.041
Liquiditätszufluss EK neue Gesellschaft *4	3.000.000																
Liquiditätsreserve vor Verpfändung	**2.629.479**	**2.280.811**	**1.954.247**	**1.649.669**	**1.366.948**	**1.017.777**	**962.718**	**935.686**	**936.560**	**965.210**	**687.033**	**713.381**	**676.488**	**622.659**	**551.321**	**9.367**	
Einzahlung auf Rückbaukonto	*45.000*	*45.000*	*45.000*	*45.000*	*45.000*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	225.000
Verpfändung Rückbau (kummuliert)	270.000	315.000	360.000	405.000	450.000	450.000	450.000	450.000	450.000	450.000	450.000	450.000	450.000	450.000	450.000	0	
40 % Kapitaldienst Folgejahr (verpfändet)	694.621	680.200	665.779	651.358	555.442	416.200	399.358	382.517	365.675	148.027	0	0	0	0	0	0	
Liquiditätsreserve nach Verpfändung	**1.664.858**	**1.285.611**	**928.468**	**593.310**	**361.507**	**151.577**	**113.360**	**103.169**	**120.885**	**367.182**	**237.033**	**263.381**	**226.488**	**172.659**	**101.321**	**9.367**	
Cash Flow	*1.534.674*	*1.537.885*	*1.523.936*	*1.509.869*	*1.495.675*	*1.489.433*	*1.435.440*	*1.421.364*	*1.407.166*	*1.392.837*	*1.231.892*	*1.166.348*	*1.103.107*	*1.086.171*	*1.068.663*	*598.046*	
Kapitaldienst	*1.772.604*	*1.736.552*	*1.700.500*	*1.664.448*	*1.628.396*	*1.388.604*	*1.040.500*	*998.396*	*956.292*	*914.188*	*370.068*	*0*	*0*	*0*	*0*	*0*	
DSCR	*87%*	*89%*	*90%*	*91%*	*92%*	*107%*	*138%*	*142%*	*147%*	*152%*	*333%*						

Zins- und Tilgungsplan

Zins- und Tilgungsplan	5,5	6,5	7,5	8,5	9,5	10,5	11,5	12,5	13,5	14,5	15,5	16,5	17,5	18,5	19,5	20,5	
	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	
Kfw "Erneuer! 4.800.000																	
Laufzeit: 10,00 Jahre Tilgung	600.000	600.000	600.000	600.000	600.000	300.000	0	0	0	0	0	0	0	0	0	0	3.300.000
Tilgungsfrei: 2,00 Jahre Tilgung kum.	2.100.000	2.700.000	3.300.000	3.900.000	4.500.000	4.800.000	4.800.000	4.800.000	4.800.000	4.800.000	4.800.000	4.800.000	4.800.000	4.800.000	4.800.000	4.800.000	
Zinssatz: 2,00 % Zinsen	60.000	48.000	36.000	24.000	12.000	3.000	0	0	0	0	0	0	0	0	0	0	183.000
Kfw "Erneuer! 8.665.000																	
Laufzeit: 15,00 Jahre Tilgung	722.083	722.083	722.083	722.083	722.083	722.083	722.083	722.083	722.083	722.083	361.042	0	0	0	0	0	7.581.875
Tilgungsfrei: 3,00 Jahre Tilgung kum.	1.805.208	2.527.292	3.249.375	3.971.458	4.693.542	5.415.625	6.137.708	6.859.792	7.581.875	8.303.958	8.665.000	8.665.000	8.665.000	8.665.000	8.665.000	8.665.000	
Zinssatz: 2,50 % Zinsen	180.521	162.469	144.417	126.365	108.313	90.260	72.208	54.156	36.104	18.052	4.513	0	0	0	0	0	997.378
Bankdarleher 1.500.000 *4	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
Laufzeit: 10,00 Jahre Tilgung	150.000	150.000	150.000	150.000	150.000	150.000	150.000	150.000	150.000	150.000	0	0	0	0	0	0	1.500.000
Tilgungsfrei: 0,00 Jahre Tilgung kum.	150.000	300.000	450.000	600.000	750.000	900.000	1.050.000	1.200.000	1.350.000	1.500.000	1.500.000	1.500.000	1.500.000	1.500.000	1.500.000	1.500.000	
Zinssatz: 4,00 % Zinsen	60.000	54.000	48.000	42.000	36.000	30.000	24.000	18.000	12.000	6.000	0	0	0	0	0	0	330.000

Berechnung der GewSt

Berechnung der GewSt		2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	
Ergebnis vor Steuer		316.518	368.906	391.417	413.875	436.268	362.327	353.598	383.637	413.639	443.593	298.833	708.048	1.110.778	1.091.574	1.071.666	1.073.532	9.238.209
Darlehenszinsen / Disagio	*100%*	*300.521*	*264.469*	*228.417*	*192.365*	*156.313*	*216.521*	*168.417*	*126.313*	*84.208*	*42.104*	*9.026*	*0*	*0*	*0*	*0*	*0*	
Pachten	*50%*	*64.328*	*64.328*	*64.328*	*64.328*	*64.328*	*64.328*	*85.396*	*85.396*	*85.396*	*85.396*	*85.396*	*85.396*	*85.396*	*85.396*	*85.396*	*85.396*	
Zwischensumme		*364.849*	*328.797*	*292.745*	*256.693*	*220.641*	*280.849*	*253.813*	*211.709*	*169.604*	*127.500*	*94.422*	*85.396*	*85.396*	*85.396*	*85.396*	*85.396*	
abzüglich Freibetrag 100.000 €		*264.849*	*228.797*	*192.745*	*156.693*	*120.641*	*180.849*	*153.813*	*111.709*	*69.604*	*27.500*	*0*	*0*	*0*	0	0	0	
Hinzurechnung	25%	66.212	57.199	48.186	39.173	30.160	45.212	38.453	27.927	17.401	6.875	0	0	0	0	0	0	
Hinzurechnung Vorlaufkosten		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
gewst. Ergebnis		382.730	426.105	439.604	453.048	466.428	407.539	392.051	411.564	431.040	450.468	298.833	708.048	1.110.778	1.091.574	1.071.666	1.073.532	
Verlustvortrag		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Verlustfeststellung		382.730	426.105	439.604	453.048	466.428	407.539	392.051	411.564	431.040	450.468	298.833	708.048	1.110.778	1.091.574	1.071.666	1.073.532	
./. Freibetrag (24.500)		-24.500	-24.500	-24.500	-24.500	-24.500	-24.500	-24.500	-24.500	-24.500	-24.500	-24.500	-24.500	-24.500	-24.500	-24.500	-24.500	
zu versteuerndes Ergebnis		**358.230**	**401.605**	**415.104**	**428.548**	**441.928**	**383.039**	**367.551**	**387.064**	**406.540**	**425.968**	**274.333**	**683.548**	**1.086.278**	**1.067.074**	**1.047.166**	**1.049.032**	**9.223.009**
Hebesatz	320%																	
Gewerbesteuer Messbetrag	3,5%	12.538	14.056	14.529	14.999	15.467	13.406	12.864	13.547	14.229	14.909	9.602	23.924	38.020	37.348	36.651	36.716	
Gewerbeertragsteuer gesamt		**40.122**	**44.980**	**46.492**	**47.997**	**49.496**	**42.900**	**41.166**	**43.351**	**45.532**	**47.708**	**30.725**	**76.557**	**121.663**	**119.512**	**117.283**	**117.492**	**1.032.977**

Abschreibungen

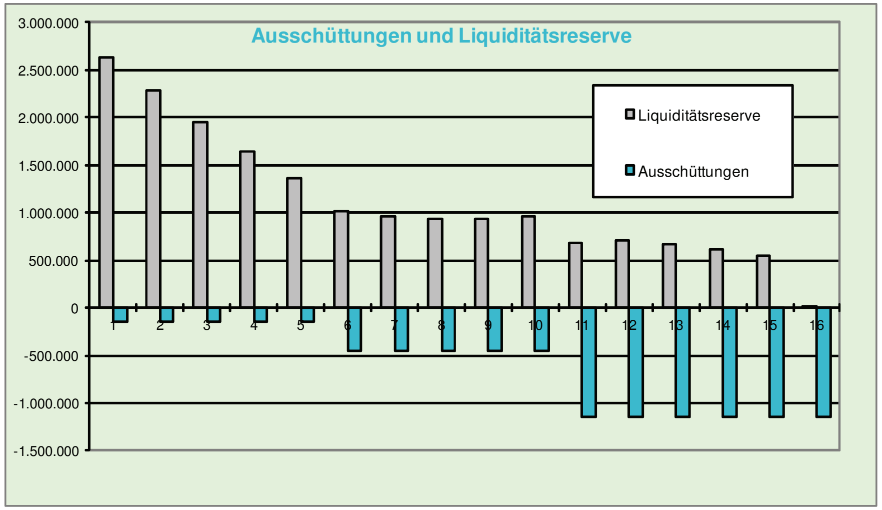
Abschreibungen		5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
		2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	kum.
Sonder-AfA	§ 7g EStG in %																	
	in €																	0
AK (lin)	13.465.000,00 €																	
ND in Jahren	**16 Jahre**																	
AfA-Satz	6,25%																	
Abschreibung in Euro		841.563	841.563	841.563	841.563	841.563	841.563	841.563	841.563	841.563	841.563	841.563	420.781					9.677.969
Restbuchwert		8.836.406	7.994.844	7.153.281	6.311.719	5.470.156	4.628.594	3.787.031	2.945.469	2.103.906	1.262.344	420.781	0	0	0	0	0	
AK (lin) *5	1.500.000,00 €																	
ND in Jahren	**16 Jahre**																	
AfA-Satz	6,25%																	
Abschreibung in Euro		93.750	93.750	93.750	93.750	93.750	93.750	93.750	93.750	93.750	93.750	93.750	93.750	93.750	93.750	93.750	93.750	1.500.000
Restbuchwert		1.406.250	1.312.500	1.218.750	1.125.000	1.031.250	937.500	843.750	750.000	656.250	562.500	468.750	375.000	281.250	187.500	93.750	0	

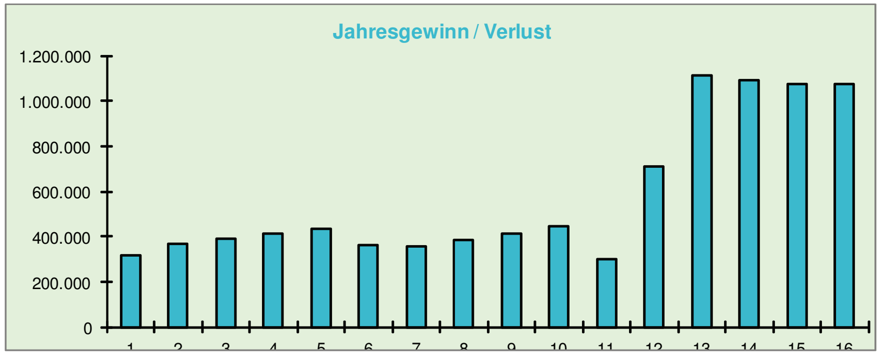
*1 Laut neuen Pachtverträgen max. zu versiegelnde Fläche = 4.000 m² bei 0,25 € pro m². Im Schnitt wird mit 750 € pro WEA gerechnet.
*3 Als Rückstellung sind 60.000 € pro MW vorgesehen. Bei 2,5 MW per WEA (3) errechnet sich eine Gesamtrückstellung von 450.000 € berechnet auf 20 Jahre.
*4 Der neuen Gesellschaft werden 3.000.000 € EK zugeführt.
*5 WEA werden der WESU Repowering mit einem "Aufgeld" in Höhe von 1.500.000 € abgekauft und finanziert.

Appendix U

Financial Ratios and Diagrams GE 2.5 WP Sustrum Süd

Kennzahlen	in %	in €
Investitionskosten pro kWh		0,55 €
Barausschüttungen kummuliert	328,00%	9.840.000,00 €
Überschuss/Jahr (vor Steuern)	14,25%	





Appendix V

Investment GE 2.5 WP Sustrum Nord

Anzahl WEA	4	1
GE 2.5-120 inkl. Trafo/Fundament		
Ausgleichsmaßnahmen		
Projektierung		
Zinsen / Bereitstellung / Aval bis IB		
ext./int Verk., Netzanb., Ü-Station		
UW- Erweiterung/Errichtung (Umspannwerk)		
Erschließung / Wegebau		
Sondernutzungsrecht Gemeinde		
Sonstiges (Gutachten/Telefon/Gebühren usw.)		
Verwaltung / Überwachung / GF bis IB		
Kauf von 4 Standortrechten WESU RePow *1	1.000.000,00 €	
Kompensation EEG-Vergütung 2019-2020 für WESU RePow/Original *2	1.265.206,00 €	
	20.200.206,00 €	**5.050.051,50 €**

*1 Vier Standortrechte in Höhe von 100.000 € pro MW gekauft von WESU RePow. Bei 2,5 MW-WEA in Summe 1.000.000 €

*2 EEG Vergütung läuft bis 2020. Zu erwartende Ausschüttungen belaufen sich auf 1.633.117 € (Barwertberechnung 1.265.206 €), dieser Betrag wird von der neuzugründenden Gesellschaft WP Sustrum Nord übernommen. Barwertberechnung zu finden in der Average-Case Prognose WESU Original

Angebotspreis GE 2.5-120 NH 139m *3 Stand: 13. Feb 13

Einzelpositionen	Einzelrichtpreis	Angebot
Grundpreis Anlage	-	
FACTS-Leistungsmerkmale	-	inkl.
Q+-Option	-	inkl.
Tageskennzeichnung rot/grau/rot	-	inkl.
Nachtkennzeichnung W-Rot	-	inkl.
Turmbefeuerung	-	inkl.
Tiefgründungsfundament mit Pfahllänge bis 20m	-	
Flachgründungsfundament mit Auftriebsicherung	-	
Gesamt		

*3 Wir nehmen an, dass die Höhenbegrenzung von 182m über NN in Sustrum entfällt. Stattdessen darf bis 200m über natürlichem Boden gebaut werden (Stand 13.02.2013 laut Rechtanwalt Berghaus). Daher wird eine maximale Turmhöhe von 139m angesetzt (zzgl. Flügelradius von 60m).

Appendix W

Investment Plan GE 2.5 WP Sustrum Nord

WINDPARK NÖRDLICHES EMSLAND GMBH

W n E GmbH
Große Straße 14
26871 Aschendorf

Gesellschaften:		
"WP Sustrum Nord"	Datum der Bearbeitung:	13.02.2013
	Bearbeiter:	S. Jansen
	Gründungsjahr:	2014

Investitionsplan	in %	in Euro	AfA-Zeitraum
GE-2.5-120 inkl. Trafo / Fundament			
Verwaltung / GF bis IB			
Ausgleichsmaßnahmen			
Standorte / UVP / Bimsch-Gen.			
Zinsen, Bereitstellung, Aval bis IB			
ext./int Verk., Netzanb., Ü-Station			
Erschließung / Wegebau			
Projektentwicklung/Rechtsberatung			
Sondernutzungsrecht Gemeinde			
Sonstiges (Gutachten/Telefon/Gebühren usw.)			
Zwischensumme	**96,65%**	**20.200.206,00 €**	
Liquiditäts- / Kostenreserve	**3,35%**	**699.794,00 €**	**kein Aufwand**
Disagio	**0,0%**	**- €**	**15 Jahre**
Summe Investitionskosten	**100,0%**	**20.900.000,00 €**	

Parkdaten			
Standort	**Sustrum**	Aufstelljahr	**2014**
WKA- Typ	**GE 2.5-120**	Inbetriebnahme	**Juli**
Nabenhöhe	**139 m**	Monate im IB-Jahr	**6**
Rotordurchmesser	**120 m**		
Wind in Narbenhöhe			
WEA-Anzahl	**4**		

Finanzierungsplan				
Fremdkapital				
Kfw "Erneuerbare Energie"				
Betrag	**28,71%**	6.000.000,00 €		
Tilgungsfrei		2,0 Jahre		
Zinssatz		2,00 %		
Laufzeit		10 Jahre		
Kfw "Erneuerbare Energie"				
Betrag	**48,33%**	10.100.000,00 €	Disagio	- €
Tilgungsfrei		3,0 Jahre		
Zinssatz		2,50 %		
Laufzeit		15 Jahre		
Euribor				
Betrag	**0,00%**	- €		
Tilgungsfrei		0,0 Jahre		
Zinssatz		2,25 %		
Laufzeit		3 Jahre		
Eigenkapital				
Kommanditisten	**22,97%**	**4.800.000,00 €**		
Summe Finanzierung	**100,00%**	**20.900.000,00 €**		

Laufende Erträge			
Energieprognose (nach Parkwirkung) *1		**40.391.126 kWh**	
abzgl. Parkwirkung *2	5,00%	2.019.556 kWh	**38.371.570 kWh**
abzgl. Verfügbarkeitsabschlag	3,00%	1.151.147 kWh	37.220.423 kWh
abzgl. Leitungsverluste	2,00%	744.408 kWh	36.476.014 kWh
abzgl. Schatten/Eis	0,00%	0 kWh	36.476.014 kWh
abzgl. Sicherheit	10,00%	4.039.113 kWh	**32.436.902 kWh**
Einspeisevergütung pro KWh *3	für	20 volle Jahre	0,0866 € pro KWh
Einspeisevergütung gesamt			**2.809.035,69 €**
		danach	0,0000 € pro KWh
			- €
Überziehungszinssatz	5,00%		
Kontokorrent Zinssatz für Guthaben	1,00%		

Allgemeine Daten		
Gewerbesteuerhebesatz		320%
Darlehen	anteilig	0,5

Laufender Aufwand		ab 1. volles Jahr		ab 3. volles Jahr		ab 6. volles Jahr		ab 11. volles Jahr	Steig. in %
Strombezug		4.000,00 €		4.243,60 €		4.637,10 €		5.375,67 €	3,00%
Vollabsicherung GE		292.000,00 €		309.782,80 €		338.508,03 €		392.423,58 €	3,00%
Pachtaufwand inkl. Festbetrag	6%	171.542,14 €	6%	171.542,14 €	6%	171.542,14 €	8%	227.722,85 €	
Verwaltung/Geschäftsf./ techn. Überwachung		140.451,78 €		144.696,94 €		151.306,46 €		163.000,03 €	1,50%
Haftpflichtversicherung		400,00 €		424,36 €		463,71 €		537,57 €	3,00%
Maschinenbruch-/ BU-Vers.		15.600,00 €		16.550,04 €		18.084,68 €		20.965,10 €	3,00%
Komplementärvergütung		2.500,00 €		2.500,00 €		2.500,00 €		2.500,00 €	
Steuerberatung / Jahresbilanz		8.000,00 €		8.487,20 €		9.274,19 €		10.751,33 €	3,00%
Sonstiges		20.000,00 €		20.012,00 €		20.030,02 €		20.060,08 €	3,00%
Zinsaufwand ab Fertigstellung		372.500,00 €		352.239,58 €		249.375,00 €		168.333,33 €	
Überziehungszinsen		- €		- €		- €		- €	
Gewerbesteuer		62.975,61 €		64.598,27 €		68.692,96 €		59.662,71 €	
Avalprovision		4.000,00 €		4.000,00 €		4.000,00 €		4.000,00 €	
Gründungskosten "Afa"		- €		- €		- €		- €	
Disagio		- €		- €		- €		- €	15 Jahre
Rückstellung für Rückbau		30.000,00 €		30.000,00 €		30.000,00 €		30.000,00 €	
Abschreibung		1.262.512,88 €		1.262.512,88 €		1.262.512,88 €		1.262.512,88 €	16 Jahre
Summe Aufwand		**2.386.482,41 €**		**2.391.589,81 €**		**2.330.927,16 €**		**2.367.845,13 €**	

*1 Als Berechnungsgrundlage dient die anemos-Windanalyse für den Windpark Ohne. Wahrscheinlichkeit P75 (75%) 101.612,9 MWh/Jahr für 16 WEA - Umrechnung auf 4 WEA. Die 29 m Differenz in der NH (110 m zu 139 m) werden mit 29 % Mehrertrag kalkuliert. 1 % pro Höhenmeter. Zusätzlich wird durch den besseren Standort in Sustrum ein Mehrertrag von 30 % im Vergleich zu Ohne erwartet. Diese Einschätzung basiert auf einen Ertragsvergleich baugleicher Anlagen (GE 1.5sl) in Ohne und Sustrum.
*2 Im Gegensatz zu Ohne (16 WEA) wird die Parkwirkung im Windpark Sustrum deutlich höher ausfallen. Derzeit besteht der Windpark aus 29 WEA. Daher wird eine zusätzliche Parkwirkung von 5 % einkalkuliert.
*3 Im Jahr 2014 Anfangsvergütung 8,66 €/Cent pro kWh ohne 0,49 €/Cent Repowering-Bonus.

Appendix X

Profit and Loss Forecast GE 2.5 WP Sustrum Nord

Ergebnisprognose	1	2	3	4	5	6	7	8	9	10
	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Erträge										
Einspeisevergütung	1.404.518	2.809.036	2.809.036	2.809.036	2.809.036	2.809.036	2.809.036	2.809.036	2.809.036	2.809.036
Zinserträge	0	11.686	25.076	34.723	36.512	34.275	32.242	27.052	22.043	17.214
Erträge gesamt	**1.404.518**	**2.820.721**	**2.834.112**	**2.843.759**	**2.845.548**	**2.843.310**	**2.841.278**	**2.836.088**	**2.831.079**	**2.826.250**
Aufwendungen										
Strombezug	2.000	4.000	4.120	4.244	4.371	4.502	4.637	4.776	4.919	5.067
Pachtaufwendungen inkl. Festbetrag *1	85.771	171.542	171.542	171.542	171.542	171.542	171.542	171.542	171.542	171.542
Vollabsicherung GE *2	146.000	292.000	300.760	309.783	319.076	328.649	338.508	348.663	359.123	369.897
Versicherungen	8.000	16.000	16.480	16.974	17.484	18.008	18.548	19.105	19.678	20.268
Komplementärvergütung	2.500	2.500	2.500	2.500	2.500	2.500	2.500	2.500	2.500	2.500
Verwaltung/Geschäftsf./ techn. Überwachung	70.226	140.452	142.559	144.697	146.867	149.070	151.306	153.576	155.880	158.218
Steuerberatung / Jahresbilanz	8.000	8.000	8.240	8.487	8.742	9.004	9.274	9.552	9.839	10.134
Rückstellung für Rückbau *3	30.000	30.000	30.000	30.000	30.000	30.000	30.000	30.000	30.000	30.000
Abschreibung	631.256	1.262.513	1.262.513	1.262.513	1.262.513	1.262.513	1.262.513	1.262.513	1.262.513	1.262.513
Sonstiges	10.000	20.000	20.006	20.012	20.018	20.024	20.030	20.036	20.042	20.048
Zinsaufwand ab Fertigstellung	186.250	372.500	368.750	352.240	321.458	285.417	249.375	213.333	177.292	141.250
Avalprovision	2.000	4.000	4.000	4.000	4.000	4.000	4.000	4.000	4.000	4.000
Aufwendungen vor Gewerbesteuer	**1.182.003**	**2.323.507**	**2.331.470**	**2.326.992**	**2.308.571**	**2.285.229**	**2.262.234**	**2.239.597**	**2.217.328**	**2.195.437**
Gewerbesteuer (siehe Berechnung)	31.008	62.976	63.479	64.598	66.000	67.354	68.693	69.638	70.562	71.464
Aufwendungen inkl. Gewerbesteuer	1.213.012	2.386.482	2.394.948	2.391.590	2.374.571	2.352.583	2.330.927	2.309.235	2.287.890	2.266.901
Jahresgewinn / Verlust	**222.514**	**497.214**	**502.642**	**516.768**	**536.976**	**558.082**	**579.043**	**596.490**	**613.751**	**630.812**

Ergebnisprognose	11	12	13	14	15	16	17	18	19	20	21	
	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	kum.
Erträge												
Einspeisevergütung	2.809.036	2.809.036	2.809.036	2.809.036	2.809.036	2.809.036	2.809.036	2.809.036	2.809.036	2.809.036	2.809.036	57.585.232
Zinserträge	12.561	10.801	10.195	9.835	9.718	9.842	12.355	12.510	11.741	10.745	9.514	360.642
Erträge gesamt	**2.821.597**	**2.819.837**	**2.819.231**	**2.818.871**	**2.818.754**	**2.818.878**	**2.821.391**	**2.821.546**	**2.820.777**	**2.819.781**	**2.818.550**	**57.945.873**
Aufwendungen												
Strombezug	5.219	5.376	5.537	5.703	5.874	6.050	6.232	6.419	6.611	6.810	7.014	109.481
Pachtaufwendungen inkl. Festbetrag *1	171.542	227.723	227.723	227.723	227.723	227.723	227.723	227.723	227.723	227.723	227.723	4.078.421
Vollabsicherung GE *2	380.994	392.424	404.196	416.322	428.812	662.514	682.390	702.861	723.947	745.666	768.036	9.420.621
Versicherungen	20.876	21.503	22.148	22.812	23.497	24.201	24.927	25.675	26.446	27.239	28.056	437.926
Komplementärvergütung	2.500	2.500	2.500	2.500	2.500	2.500	2.500	2.500	2.500	2.500	2.500	52.500
Verwaltung/Geschäftsf./ techn. Überwachung	160.591	163.000	165.445	167.927	170.446	173.002	175.597	178.231	180.905	183.618	186.373	3.317.986
Steuerberatung / Jahresbilanz	10.438	10.751	11.074	11.406	11.748	12.101	12.464	12.838	13.223	13.619	14.028	222.963
Rückstellung für Rückbau *3	30.000	30.000	30.000	30.000	30.000	30.000	30.000	30.000	30.000	30.000	0	600.000
Abschreibung	1.262.513	1.262.513	1.262.513	1.262.513	1.262.513	1.262.513	631.256	0	0	0	0	20.200.206
Sonstiges	20.054	20.060	20.066	20.072	20.078	20.084	20.090	20.096	20.102	20.108	20.114	411.142
Zinsaufwand ab Fertigstellung	217.917	168.333	126.250	84.167	42.083	10.521	0	0	0	0	0	3.317.135
Avalprovision	4.000	4.000	4.000	4.000	4.000	4.000	4.000	4.000	4.000	4.000	4.000	82.000
Aufwendungen vor Gewerbesteuer	**2.286.644**	**2.308.182**	**2.281.452**	**2.255.145**	**2.229.274**	**2.435.210**	**1.817.180**	**1.210.344**	**1.235.457**	**1.261.283**	**1.257.844**	**42.250.382**
Gewerbesteuer (siehe Berechnung)	62.874	59.663	61.410	63.138	64.844	40.910	110.116	178.099	175.200	172.196	172.443	1.796.664
Aufwendungen inkl. Gewerbesteuer	2.349.518	2.367.845	2.342.862	2.318.283	2.294.118	2.476.119	1.927.295	1.388.442	1.410.657	1.433.479	1.430.287	44.047.046
Jahresgewinn / Verlust	**534.953**	**511.654**	**537.779**	**563.726**	**589.480**	**383.668**	**1.004.211**	**1.611.202**	**1.585.320**	**1.558.498**	**1.560.706**	**15.695.491**

Liquiditätsprognose	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Jahresgewinn / Verlust	222.514	497.214	502.642	516.768	536.976	558.082	579.043	596.490	613.751	630.812
zzgl. Zuführung Rückstellung	30.000	30.000	30.000	30.000	30.000	30.000	30.000	30.000	30.000	30.000
zzgl. Abschreibung	631.256	1.262.513	1.262.513	1.262.513	1.262.513	1.262.513	1.262.513	1.262.513	1.262.513	1.262.513
zzgl. "finanzierte" Liquiditätsreserve	699.794									
abzgl. einbehaltene Zinsabschlagsteuer	0	-3.698	-7.937	-10.990	-11.556	-10.848	-10.205	-8.562	-6.977	-5.448
abzgl. GewSt	-31.008	-62.976	-63.479	-64.598	-66.000	-67.354	-68.693	-69.638	-70.562	-71.464
abzgl. Tilgung	0	0	-375.000	-1.170.833	-1.591.667	-1.591.667	-1.591.667	-1.591.667	-1.591.667	-1.591.667
abzgl. Rückbaukosten inkl. Sanierung	0	0	0	0	0	0	0	0	0	0
abzgl. Ausschüttungen	**-384.000**	**-384.000**	**-384.000**	**-384.000**	**-384.000**	**-384.000**	**-720.000**	**-720.000**	**-720.000**	**-720.000**
Ausschüttung in % zum EK	**8,00%**	**8,00%**	**8,00%**	**8,00%**	**8,00%**	**8,00%**	**15,00%**	**15,00%**	**15,00%**	**15,00%**
Liquiditätsüberschuss	1.168.556	1.339.053	964.740	178.859	-223.733	-203.275	-519.008	-500.863	-482.941	-465.253
Liquiditätsreserve vor Verpfändung	**1.168.556**	**2.507.610**	**3.472.350**	**3.651.209**	**3.427.475**	**3.224.201**	**2.705.193**	**2.204.330**	**1.721.388**	**1.256.135**
Einzahlung auf Rückbaukonto	*60.000*	*60.000*	*60.000*	*60.000*	*60.000*	*60.000*	*60.000*	*60.000*	*60.000*	*60.000*
Verpfändung Rückbau (kummuliert)	60.000	120.000	180.000	240.000	300.000	360.000	420.000	480.000	540.000	600.000
40 % Kapitaldienst Folgejahr (verpfändet)	0	0	609.229	765.250	750.833	736.417	722.000	707.583	693.167	573.833
Liquiditätsreserve nach Verpfändung	**1.108.556**	**2.387.610**	**2.683.121**	**2.645.959**	**2.376.642**	**2.127.784**	**1.563.193**	**1.016.746**	**488.222**	**82.302**
Cash Flow	*1.738.806*	*2.095.553*	*2.092.490*	*2.085.932*	*2.073.392*	*2.057.809*	*2.042.034*	*2.024.137*	*2.006.017*	*1.987.663*
Kapitaldienst	*186.250*	*372.500*	*743.750*	*1.523.073*	*1.913.125*	*1.877.083*	*1.841.042*	*1.805.000*	*1.768.958*	*1.732.917*
DSCR *0,00*	*934%*	*563%*	*281%*	*137%*	*108%*	*110%*	*111%*	*112%*	*113%*	*115%*

Liquiditätsprognose	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	kum.
Jahresgewinn / Verlust	534.953	511.654	537.779	563.726	589.480	383.668	1.004.211	1.611.202	1.585.320	1.558.498	1.560.706	15.695.491
zzgl. Zuführung Rückstellung	30.000	30.000	30.000	30.000	30.000	30.000	30.000	30.000	30.000	30.000	0	600.000
zzgl. Abschreibung	1.262.513	1.262.513	1.262.513	1.262.513	1.262.513	1.262.513	631.256	0	0	0	0	20.200.206
zzgl. "finanzierte" Liquiditätsreserve												699.794
abzgl. einbehaltene Zinsabschlagsteuer	-3.976	-3.418	-3.227	-3.113	-3.076	-3.115	-3.910	-3.959	-3.716	-3.401	-3.011	-114.143
abzgl. GewSt	-62.874	-59.663	-61.410	-63.138	-64.844	-40.910	-110.116	-178.099	-175.200	-172.196	-172.443	-1.796.664
abzgl. Tilgung	-1.216.667	-841.667	-841.667	-841.667	-841.667	-420.833	0	0	0	0	0	-16.100.000
abzgl. Rückbaukosten inkl. Sanierung	0	0	0	0	0	0	0	0	0	0	-600.000	-600.000
abzgl. Ausschüttungen	**-720.000**	**-960.000**	**-960.000**	**-960.000**	**-960.000**	**-960.000**	**-1.536.000**	**-1.536.000**	**-1.536.000**	**-1.536.000**	**-1.728.000**	**-18.576.000**
Ausschüttung in % zum EK	**15,00%**	**20,00%**	**20,00%**	**20,00%**	**20,00%**	**20,00%**	**32,00%**	**32,00%**	**32,00%**	**32,00%**	**36,00%**	**387,00%**
Liquiditätsüberschuss	-176.051	-60.581	-36.012	-11.679	12.406	251.323	15.442	-76.856	-99.596	-123.099	-942.748	8.685
Liquiditätsreserve vor Verpfändung	**1.080.084**	**1.019.503**	**983.492**	**971.813**	**984.219**	**1.235.542**	**1.250.984**	**1.174.128**	**1.074.532**	**951.433**	**8.685**	
Einzahlung auf Rückbaukonto	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	600.000
Verpfändung Rückbau (kummuliert)	600.000	600.000	600.000	600.000	600.000	600.000	600.000	600.000	600.000	600.000	0	
40 % Kapitaldienst Folgejahr (verpfändet)	404.000	387.167	370.333	353.500	172.542	0	0	0	0	0	0	
Liquiditätsreserve nach Verpfändung	**76.084**	**32.337**	**13.158**	**18.313**	**211.678**	**635.542**	**650.984**	**574.128**	**474.532**	**351.433**	**8.685**	
Cash Flow	*1.978.533*	*1.909.419*	*1.891.905*	*1.874.155*	*1.856.156*	*1.642.677*	*1.551.442*	*1.459.144*	*1.436.404*	*1.412.901*	*785.252*	
Kapitaldienst	*1.434.583*	*1.010.000*	*967.917*	*925.833*	*883.750*	*431.354*	*0*	*0*	*0*	*0*	*0*	
DSCR	*138%*	*189%*	*195%*	*202%*	*210%*	*381%*						

Zins- und Tilgungsplan	0,5	1,5	2,5	3,5	4,5	5,5	6,5	7,5	8,5	9,5
	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Kfw "Erneuerl 6.000.000										
Laufzeit: 10,00 Jahre Tilgung	0	0	375.000	750.000	750.000	750.000	750.000	750.000	750.000	750.000
Tilgungsfrei: 2,00 Jahre Tilgung kum.	0	0	375.000	1.125.000	1.875.000	2.625.000	3.375.000	4.125.000	4.875.000	5.625.000
Zinssatz: 2,00 % Zinsen	60.000	120.000	116.250	105.000	90.000	75.000	60.000	45.000	30.000	15.000
Kfw "Erneuerl 10.100.000										
Laufzeit: 15,00 Jahre Tilgung	0	0	0	420.833	841.667	841.667	841.667	841.667	841.667	841.667
Tilgungsfrei: 3,00 Jahre Tilgung kum.	0	0	0	420.833	1.262.500	2.104.167	2.945.833	3.787.500	4.629.167	5.470.833
Zinssatz: 2,50 % Zinsen	126.250	252.500	252.500	247.240	231.458	210.417	189.375	168.333	147.292	126.250

Zins- und Tilgungsplan	10,5	11,5	12,5	13,5	14,5	15,5	16,5	17,5	18,5	19,5	20,5	
	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	
Kfw "Erneuerl 6.000.000												
Laufzeit: 10,00 Jahre Tilgung	375.000	0	0	0	0	0	0	0	0	0	0	6.000.000
Tilgungsfrei: 2,00 Jahre Tilgung kum.	6.000.000	6.000.000	6.000.000	6.000.000	6.000.000	6.000.000	6.000.000	6.000.000	6.000.000	6.000.000	6.000.000	
Zinssatz: 2,00 % Zinsen	3.750	0	0	0	0	0	0	0	0	0	0	720.000
Kfw "Erneuerl 10.100.000												
Laufzeit: 15,00 Jahre Tilgung	841.667	841.667	841.667	841.667	841.667	420.833	0	0	0	0	0	10.100.000
Tilgungsfrei: 3,00 Jahre Tilgung kum.	6.312.500	7.154.167	7.995.833	8.837.500	9.679.167	10.100.000	10.100.000	10.100.000	10.100.000	10.100.000	10.100.000	
Zinssatz: 2,50 % Zinsen	105.208	84.167	63.125	42.083	21.042	5.260	0	0	0	0	0	2.272.500

Berechnung der GewSt	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Ergebnis vor Steuer	222.514	497.214	502.642	516.768	536.976	558.082	579.043	596.490	613.751	630.812
Darlehenszinsen / Disagio 100%	*372.500*	*372.500*	*368.750*	*352.240*	*321.458*	*285.417*	*249.375*	*213.333*	*177.292*	*141.250*
Pachten 50%	*42.886*	*85.771*	*85.771*	*85.771*	*85.771*	*85.771*	*85.771*	*85.771*	*85.771*	*85.771*
Zwischensumme	*415.386*	*458.271*	*454.521*	*438.011*	*407.229*	*371.188*	*335.146*	*299.104*	*263.063*	*227.021*
abzüglich Freibetrag 100.000 €	*315.386*	*358.271*	*354.521*	*338.011*	*307.229*	*271.188*	*235.146*	*199.104*	*163.063*	*127.021*
Hinzurechnung 25%	78.846	89.568	88.630	84.503	76.807	67.797	58.787	49.776	40.766	31.755
Hinzurechnung Vorlaufkosten	0	0	0	0	0	0	0	0	0	0
gewst. Ergebnis	301.361	586.782	591.272	601.270	613.784	625.878	637.830	646.267	654.517	662.567
Verlustvortrag		0	0	0	0	0	0	0	0	0
Verlustfeststellung	301.361	586.782	591.272	601.270	613.784	625.878	637.830	646.267	654.517	662.567
./. Freibetrag (24.500)	-24.500	-24.500	-24.500	-24.500	-24.500	-24.500	-24.500	-24.500	-24.500	-24.500
zu versteuerndes Ergebnis	**276.861**	**562.282**	**566.772**	**576.770**	**589.284**	**601.378**	**613.330**	**621.767**	**630.017**	**638.067**
Hebesatz 320%										
Gewerbesteuer Messbetrag 3,5%	9.690	19.680	19.837	20.187	20.625	21.048	21.467	21.762	22.051	22.332
Gewerbeertragsteuer gesamt	**31.008**	**62.976**	**63.479**	**64.598**	**66.000**	**67.354**	**68.693**	**69.638**	**70.562**	**71.464**

Berechnung der GewSt	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	
Ergebnis vor Steuer	534.953	511.654	537.779	563.726	589.480	383.668	1.004.211	1.611.202	1.585.320	1.558.498	1.560.706	15.695.491
Darlehenszinsen / Disagio 100%	*217.917*	*168.333*	*126.250*	*84.167*	*42.083*	*10.521*	*0*	*0*	*0*	*0*	*0*	
Pachten 50%	*85.771*	*113.861*	*113.861*	*113.861*	*113.861*	*113.861*	*113.861*	*113.861*	*113.861*	*113.861*	*113.861*	
Zwischensumme	*303.688*	*282.195*	*240.111*	*198.028*	*155.945*	*124.382*	*113.861*	*113.861*	*113.861*	*113.861*	*113.861*	
abzüglich Freibetrag 100.000 €	*203.688*	*182.195*	*140.111*	*98.028*	*55.945*	*24.382*	*13.861*	*13.861*	13.861	13.861	13.861	
Hinzurechnung 25%	50.922	45.549	35.028	24.507	13.986	6.096	3.465	3.465	3.465	3.465	3.465	
Hinzurechnung Vorlaufkosten	0	0	0	0	0	0	0	0	0	0	0	
gewst. Ergebnis	585.875	557.203	572.807	588.233	603.466	389.764	1.007.677	1.614.667	1.588.785	1.561.963	1.564.172	
Verlustvortrag	0	0	0	0	0	0	0	0	0	0	0	
Verlustfeststellung	585.875	557.203	572.807	588.233	603.466	389.764	1.007.677	1.614.667	1.588.785	1.561.963	1.564.172	
./. Freibetrag (24.500)	-24.500	-24.500	-24.500	-24.500	-24.500	-24.500	-24.500	-24.500	-24.500	-24.500	-24.500	
zu versteuerndes Ergebnis	**561.375**	**532.703**	**548.307**	**563.733**	**578.966**	**365.264**	**983.177**	**1.590.167**	**1.564.285**	**1.537.463**	**1.539.672**	**16.041.640**
Hebesatz 320%												
Gewerbesteuer Messbetrag 3,5%	19.648	18.645	19.191	19.731	20.264	12.784	34.411	55.656	54.750	53.811	53.889	
Gewerbeertragsteuer gesamt	**62.874**	**59.663**	**61.410**	**63.138**	**64.844**	**40.910**	**110.116**	**178.099**	**175.200**	**172.196**	**172.443**	**1.796.664**

Abschreibungen	0	1	2	3	4	5	6	7	8	9
	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Sonder-AfA § 7g EStG in %	0,0%	0,0%	0,0%	0,0%	0,0%					
in €	0	0	0	0	0					
AK (lin) 20.200.206,00 €										
ND in Jahren **16 Jahre**										
AfA-Satz 6,25%										
Abschreibung in Euro	631.256	1.262.513	1.262.513	1.262.513	1.262.513	1.262.513	1.262.513	1.262.513	1.262.513	1.262.513
Restbuchwert	19.568.950	18.306.437	17.043.924	15.781.411	14.518.898	13.256.385	11.993.872	10.731.359	9.468.847	8.206.334

Abschreibungen	10	11	12	13	14	15	16	17	18	19	20	
	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	kum.
Sonder-AfA § 7g EStG in %												
in €												0
AK (lin) 20.200.206,00 €												
ND in Jahren **16 Jahre**												
AfA-Satz 6,25%												
Abschreibung in Euro	1.262.513	1.262.513	1.262.513	1.262.513	1.262.513	1.262.513	631.256					20.200.206
Restbuchwert	6.943.821	5.681.308	4.418.795	3.156.282	1.893.769	631.256	0	0	0	0	0	

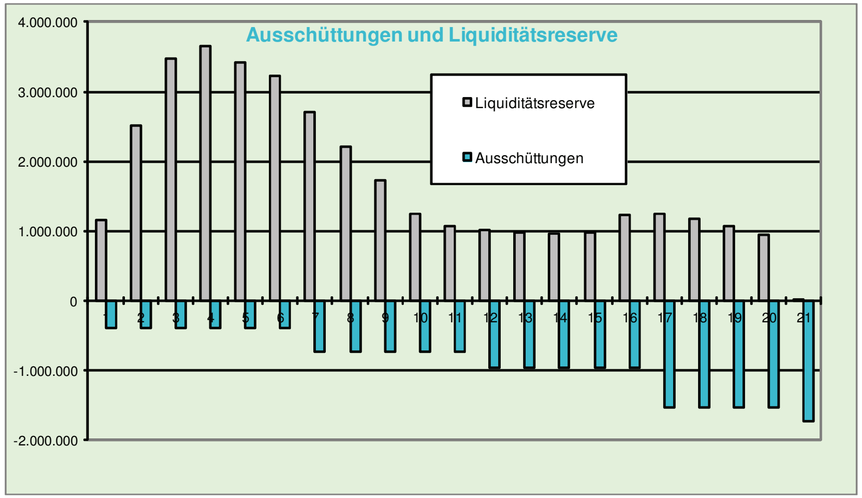
*1 Laut neuen Pachtverträgen max. zu versiegelnde Fläche = 4.000 m² bei 0,25 € pro m². Im Schnitt wird mit 750 € pro WEA gerechnet

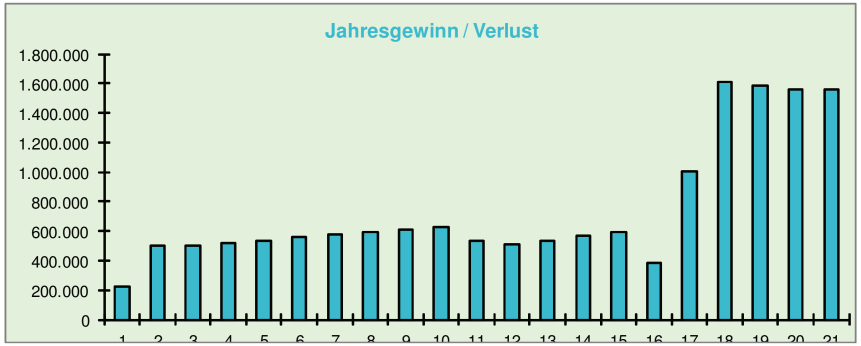
*3 Als Rückstellung sind 60.000 € pro MW vorgesehen. Bei 2,5 MW per WEA (4) errechnet sich eine Gesamtrückstellung von 600.000 € berechnet auf 20 Jahre

Appendix Y

Financial Ratios and Diagrams GE 2.5 WP Sustrum Nord.

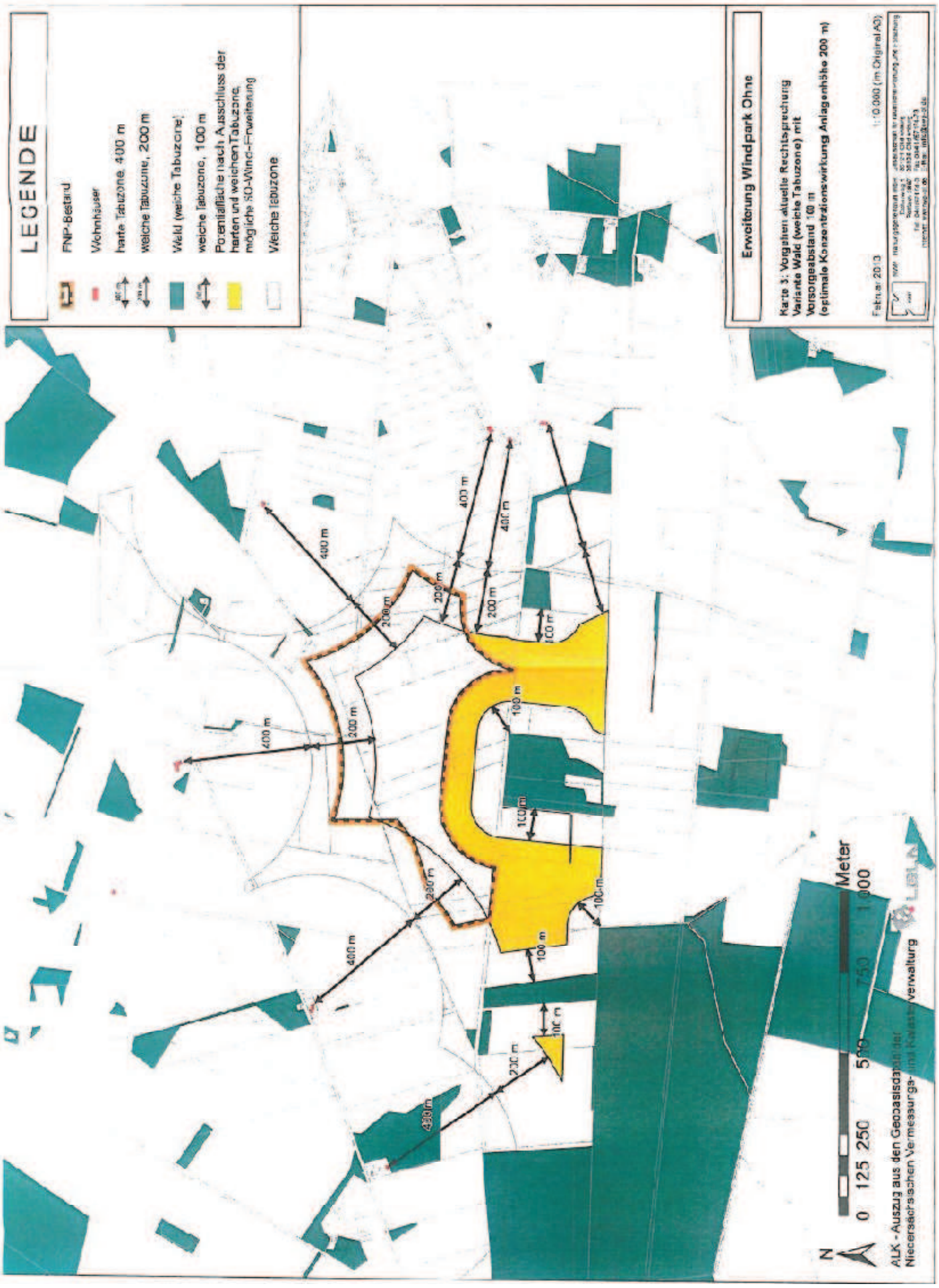
Kennzahlen	in %	in €
Investitionskosten pro kWh		0,64 €
Barausschüttungen kummuliert	387,00%	18.576.000,00 €
Überschuss/Jahr (vor Steuern)	14,35%	





Appendix A-2

Flächennutzungsplan Ohne



Appendix B-2

Anemos Wind Analysis Dörpen/Neubörger

D-91018-3968-Rev.02-NB-JR

A) Abschattung der Anlagen in Neubörger (3x E82) auf die Bestandsanlagen WEA 34, 35, 36 und 37

WEA	feier Ertrag	Ertrag ohne Neubörger	Eff.	Ertrag mit Neubörger	Eff.	Verlust	Verlust
	kWh	kWh	%	kWh	%	kWh	%
34	1'331'324	1'288'118	96.75	1'254'816	94.25	33'302	2.59
35	1'328'418	1'295'699	97.54	1'282'321	96.53	13'378	1.03
36	1'331'161	1'294'505	97.25	1'212'116	91.06	82'389	6.36
37	1'332'862	1'304'489	97.87	1'246'278	93.50	58'211	4.46
SUMME	**5'323'765**	**5'182'811**	**92.23**	**4'995'531**	**93.83**	**187'280**	**3.61**

Durch den Zubau der 3 WEA in Neubörger verringert sich der Ertrag der aufgeführten Bestandsanlagen um 3.61 %, bzw. 187 MWh.

B) Abschattung der Anlagen Dörpen (WEA 1 bis 11) auf die Bestandsanlagen No. 28, 29, 31, 32, 33, 38 und 39 (Windpark Dörpen Ost KG)

WEA	feier Ertrag	Ertrag ohne Dörpen	Eff.	Ertrag mit Dörpen	Eff.	Verlust	Verlust
	kWh	kWh	%	kWh	%	kWh	%
28	3'862'323	3'651'867	94.55	3'296'638	85.35	355'229	9.73
29	3'853'993	3'747'617	97.24	3'430'570	89.01	317'047	8.46
31	3'850'441	3'589'125	93.21	3'339'782	86.74	249'343	6.95
32	3'862'943	3'639'652	94.22	3'212'723	83.17	426'929	11.73
33	3'870'129	3'648'650	94.28	3'213'307	83.03	435'343	11.93
38	1'332'780	1'279'534	96.00	1'253'192	94.03	26'342	2.06
39	1'325'686	1'250'661	94.34	1'220'059	92.03	30'602	2.45
SUMME	**21'958'295**	**20'807'106**	**94.76**	**18'966'271**	**86.37**	**1'840'835**	**8.85**

Der zu erwartende Verlust der sieben Anlagen beträgt 1841 MWh pro Jahr Jahr bzw. 8.85 % des Ertrages vor Zubau der 11 Anlagen. Die WEA Neubörger wurden bei den Berechnungen als Belastung mit berücksichtigt, die geplanten WEA 12 und 13 nicht.

C) Abschattung der Anlagen Dörpen (WEA 1 bis 11) auf die Bestandsanlage No. 30 (W+W Abrechnungs GbR)

WEA	feier Ertrag	Ertrag ohne Dörpen	Eff.	Ertrag mit Dörpen	Eff.	Verlust	Verlust
	kWh	kWh	%	kWh	%	kWh	%
30	3'851'606	3'7958'304	98.54	3'358'977	87.21	436'327	11.50

Der zu erwartende Verlust der Anlage beträgt 436 MWh pro Jahr bzw. 11.50 % des Ertrages vor Zubau der 11 Anlagen. Die Anlagen Neubörger wurden bei den Berechnungen als Belastung mit berücksichtigt, die Anlagen 12 + 13 nicht.

D) Abschattung der Erweiterung Dörpen (WEA 12 + 13) auf die Bestandsanlagen No. 28, 29, 31, 32, 33, 38 und 39 (Windpark Dörpen Ost KG)

WEA	feier Ertrag	Ertrag ohne WEA 12+13	Eff.	Ertrag mit WEA 12+13	Eff.	Verlust	Verlust
	kWh	kWh	%	kWh	%	kWh	%
28	3'862'323	3'296'638	85.35	3294'554	85.30	2'084	0.06
29	3'853'993	3'430'570	89.01	3'426'464	88.91	4'106	0.12
31	3'850'441	3'339'782	86.74	3'337'297	86.67	2'485	0.07
32	3'862'943	3'212'723	83.17	3'204'673	82.96	8'050	0.25
33	3'870'129	3'213'307	83.03	3'162'032	81.70	51'275	1.60
38	1'332'780	1'253.192	94.03	1'250'334	93.81	2'858	0.23
39	1'325'686	1'220.059	92.03	1'216'423	91.76	3'636	0.30
SUMME	**21'958'295**	**18'966'271**	**86.37**	**18'891'777**	86.03	**74'494**	**0.39**

Der zu erwartende Verlust der Anlagen beträgt 74 MWh pro Jahr bzw. 0.39 % des Ertrages vor Zubau der beiden Anlagen. Die Anlagen 1 - 11 sowie die Anlagen Neubörger wurden bei den Berechnungen als Belastung mit berücksichtigt.

E) Abschattung der Anlagen Dörpen (WEA 12 + 13) auf die Bestandsanlage No. 30 (W+W Abrechnungs GbR)

WEA	feier Ertrag	Ertrag ohne Dörpen	Eff.	Ertrag mit Dörpen	Eff.	Verlust	Verlust
	kWh	kWh	%	kWh	%	kWh	%
30	3851.606	3358.977	87.21	3314.956	86.07	44.021	1.31

Der zu erwartende Verlust der Anlage beträgt 44 MWh pro Jahr bzw. 1.31 % des Ertrages vor Zubau der beiden Anlagen. Die Anlagen 1 - 11 sowie die Anlagen Neubörger wurden bei den Berechnungen als Belastung mit berücksichtigt.

Appendix C-2

Investment E-101 WP Ohne Expansion

Anzahl WEA	3	1
E 101 inkl. Trafo/Fundament		
Ausgleichsmaßnahmen		
Projektierung		
Zinsen / Bereitstellung / Aval bis IB		
ext./int Verk., Netzanb., Ü-Station		
UW- Erweiterung/Errichtung (Umspannwerk)	- €	- €
Erschließung / Wegebau		
Sondernutzungsrecht Gemeinde		
Sonstiges (Gutachten/Telefon/Gebühren usw.)		
Verwaltung / Überwachung / GF bis IB		
Kauf Repowering-Ansprüche	483.409,94 €	160.448,36 €
	14.578.409,94 €	**4.858.781,69 €**

Angebotspreis E-101 3.0 MW NH 135m * Stand: 13. Feb 13

Einzelpositionen	Einzelrichtpreis	Angebot
Grundpreis Anlage		
FACTS-Leistungsmerkmale		inkl.
Q+-Option		inkl.
Tageskennzeichnung rot/grau/rot		inkl.
Nachtkennzeichnung W-Rot		inkl.
Turmbefeuerung		inkl.
Mehrpreis NH 149m		- €
Tiefgründungsfundament mit Pfahllänge bis 20m		
Flachgründungsfundament mit Auftriebsicherung		
Gesamt		

* Berechnung auf Basis des Angebots für 135m Turm. In Ohne wird aber ein 125m Turm gebaut. Mehrpreis als Puffer einkalkuliert.

Appendix D-2

Confirmation Email: RWE 240kV

Informationen zur externen Verkabelung (von der WEA Ohne 5 zur UA Schüttdorf)

Guten Tag Herr Jansen, guten Tag Herr Coßmann

für das angenehme Gespräch in Ihrem Hause bedanke ich mich herzlich. Anliegend die Bewertung zur Übertragungsfähigkeit Ihrer bestehenden 30kV-Trasse WP Ohne – UA Schüttdorf. Auf Grundlage Ihrer Angaben kann u.E. über die 240er-Trasse rd. 19,5 MW Wirkleistung übertragen werden. Die stromabhängigen Verluste steigen dabei natürlich an, aber zunächst kann die Einspeisung erst einmal in der Größenordnung über die bestehende Trasse erfolgen.

Zur Einspeisemöglichkeit der Mehrleistung in Schüttdorf müssen Sie den zuständigen Netzbetreiber anfragen. Hierzu können wir keine Aussage treffen.

Ich melde mich nochmal telefonisch bei Ihnen.

Wir hoffen Ihnen mit der Aussage gedient zu haben und stehen Ihnen jederzeit für weitere Gespräche zur Verfügung.

Freundliche Grüße

i.V. Wilhelm Rose

RWE Netzservice GmbH

Key Account Vertrieb

Rheinlanddamm 24, 44139 Dortmund

T extern   +49-0231/438-4809

T intern   711-4809

F extern   +49-0231/438-384809

Mobil   01722335462

Geschäftsführung: Klaus Engelbertz, Jens Schmidt

Sitz der Gesellschaft: Siegen

Eingetragen beim Amtsgericht Siegen

Handelsregister-Nr. HR B 9945

USt-IdNr. DE 8137 61 348

Appendix E-2

Repowering-Bonus E-101 WP Ohne Expansion

Barwertberechnung / Kapitalwertberechnung

Repowering-Bonus

Jahr	Perioden (n)	Repowering- Bonus (K_1)	Wiederanlagezins (p) *1	Barwert in € (K_0) *2
2014	0,5	12.947	0,0507	12.631
2015	1,5	25.895	0,0507	24.043
2016	2,5	25.895	0,0507	22.883
2017	3,5	25.895	0,0507	21.779
2018	4,5	25.895	0,0507	20.728
…	…	…	…	…
2034	20,5	12.947	0,0507	4.698
kum.		**517.894**		**320.897**

Annahmen:			
	Energieprognose	5.284.636	kWh/Jahr
	Wiederanlagezins (p)	5,07	%
	Repowering- Bonus	0,49	€Cent/kWh
	Anlagezeitraum (n)	20	Jahre

Repowering- Bonus pro WEA gesplittet (€): **160.448**

*1 gemäß Abzinsungszinssatztabelle der Deutsche Bundesbank vom 31.03.2013

*2 Formel: $K_0 = K_1/(1+p)^n$

Detailrechnung

Jahr	Periode	Bonus	Barwert
2014	0,5	12.947	12.631
2015	1,5	25.895	24.043
2016	2,5	25.895	22.883
2017	3,5	25.895	21.779
2018	4,5	25.895	20.728
2019	5,5	25.895	19.728
2020	6,5	25.895	18.776
2021	7,5	25.895	17.870
2022	8,5	25.895	17.008
2023	9,5	25.895	16.187
2024	10,5	25.895	15.406
2025	11,5	25.895	14.662
2026	12,5	25.895	13.955
2027	13,5	25.895	13.282
2028	14,5	25.895	12.641
2029	15,5	25.895	12.031
2030	16,5	25.895	11.450
2031	17,5	25.895	10.898
2032	18,5	25.895	10.372
2033	19,5	25.895	9.871
2034	20,5	12.947	4.698
		517.894	**320.897**

Appendix F-2

Investment Plan E-101 WP Ohne Expansion

W n E GmbH
Große Straße 14
26871 Aschendorf

Gesellschaften:

"WP Ohne Erweiterung"		Datum der Bearbeitung:	01.08.2012
		Bearbeiter:	S. Jansen
		Gründungsjahr:	2014

Investitionsplan

Investitionsplan	in %	in Euro	AfA-Zeitraum
E-101 inkl. Trafo / Fundament			
Verwaltung / GF bis IB			
Ausgleichsmaßnahmen			
Standorte / UVP / Bimsch-Gen.			
Zinsen, Bereitstellung, Aval bis IB			
ext./int Verk., Netzanb., Ü-Station			
Erschließung / Wegebau			
Projektentwicklung/Rechtsberatung			
Sondernutzungsrecht Gemeinde			
Sonstiges (Gutachten/Telefon/Gebühren usw.)			
Zwischensumme	**97,19%**	**14.578.409,94 €**	
Liquiditäts- / Kostenreserve	**2,81%**	**421.590,06 €**	**kein Aufwand**
Disagio	**0,0%**	**- €**	**15 Jahre**
Summe Investitionskosten	**100,0%**	**15.000.000,00 €**	

Parkdaten

Standort	**Ohne**		Aufstelljahr	**2014**
WKA- Typ	**E-101 3.0 MW**		Inbetriebnahme	**Juli**
Nabenhöhe	**125 m**		Monate im IB-Jahr	**6**
Rotordurchmesser	**101 m**			
Wind in Narbenhöhe	**zw. 6,26 u. 6,42 m/s**	(lt. anemos)		
WEA-Anzahl	**3**			

Finanzierungsplan

Fremdkapital				
Kfw "Erneuerbare Energie"				
Betrag	**21,33%**	3.200.000,00 €		
Tilgungsfrei		2,0 Jahre		
Zinssatz		2,00 %		
Laufzeit		10 Jahre		
Kfw "Erneuerbare Energie"				
Betrag	**55,33%**	8.300.000,00 €	Disagio	- €
Tilgungsfrei		3,0 Jahre		
Zinssatz		2,50 %		
Laufzeit		15 Jahre		
Euribor				
Betrag	**0,00%**	- €		
Tilgungsfrei		0,0 Jahre		
Zinssatz		2,25 %		
Laufzeit		3 Jahre		
Eigenkapital				
Kommanditisten	**23,33%**	**3.500.000,00 €**		
Summe Finanzierung	**100,00%**	**15.000.000,00 €**		

Laufende Erträge

Energieprognose (nach Parkwirkung) *1		**17.603.719 kWh**	(lt. anemos)
abzgl. Parkwirkung (siehe oben)	0,00%	0 kWh	**17.603.719 kWh**
abzgl. Verfügbarkeitsabschlag	3,00%	528.112 kWh	17.075.607 kWh
abzgl. Leitungsverluste	2,00%	341.512 kWh	16.734.095 kWh
abzgl. Schatten/Eis	0,00%	0 kWh	16.734.095 kWh
abzgl. Sicherheit	5,00%	880.186 kWh	**15.853.909 kWh**
Einspeisevergütung pro KWh *2	für	20 volle Jahre	0,0915 € pro KWh
Einspeisevergütung gesamt			**1.450.632,68 €**
		danach	0,0000 € pro KWh
			- €
Überziehungszinssatz	5,00%		
Kontokorrent Zinssatz für Guthaben	1,00%		

Allgemeine Daten

Gewerbesteuerhebesatz		320%
Darlehen	anteilig	0,5

Laufender Aufwand

Laufender Aufwand		ab 1. volles Jahr		ab 3. volles Jahr		ab 6. volles Jahr		ab 11. volles Jahr	Steig. in %
Strombezug		3.000,00 €		3.182,70 €		3.477,82 €		4.031,75 €	3,00%
Entschädigung für Ertrags-minderung (Ohne alt)		139.427,84 €		139.427,84 €		139.427,84 €		- €	
Enercon-Partner-Konzept		- €		96.820,45 €		211.417,14 €		245.090,41 €	3,00%
Pachtaufwand inkl. Festbetrag	4%	60.275,31 €	4%	60.275,31 €	4%	60.275,31 €	5%	74.781,63 €	
Verwaltung/Geschäftsf./ techn. Überwachung		72.531,63 €		74.723,90 €		78.137,17 €		84.175,92 €	1,50%
Haftpflichtversicherung		300,00 €		318,27 €		347,78 €		403,17 €	3,00%
Maschinenbruch-/ BU-Vers.		11.700,00 €		12.412,53 €		13.563,51 €		15.723,82 €	3,00%
Komplementärvergütung		2.500,00 €		2.500,00 €		2.500,00 €		2.500,00 €	
Steuerberatung / Jahresbilanz		6.000,00 €		6.365,40 €		6.955,64 €		8.063,50 €	3,00%
Sonstiges		15.000,00 €		15.009,00 €		15.022,51 €		15.045,06 €	3,00%
Zinsaufwand ab Fertigstellung		271.500,00 €		259.177,08 €		187.625,00 €		138.333,33 €	
Überziehungszinsen		- €		- €		- €		- €	
Gewerbesteuer		- €		- €		- €		- €	
Avalprovision		4.000,00 €		4.000,00 €		4.000,00 €		4.000,00 €	
Gründungskosten "Afa"		- €		- €		- €		- €	
Disagio		- €		- €		- €		- €	15 Jahre
Rückstellung für Rückbau		27.000,00 €		27.000,00 €		27.000,00 €		27.000,00 €	
Abschreibung		911.150,62 €		911.150,62 €		911.150,62 €		911.150,62 €	16 Jahre
Summe Aufwand		**1.524.385,40 €**		**1.612.363,11 €**		**1.660.900,35 €**		**1.530.299,23 €**	

*1 Lt. anemos Wahrscheinlichkeit P75 (75%) ,
*2 Im Jahr 2014 Anfangsvergütung 8,66 €/Cent pro kWh zzgl. 0,49 €/Cent Repowering-Bonus

Appendix G-2

Profit and Loss Forecast E-101 WP Ohne Expansion

Ergebnisprognose	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	
	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	kum.
Erträge																						
Einspeisevergütung	725.316	1.450.633	1.450.633	1.450.633	1.450.633	1.450.633	1.450.633	1.450.633	1.450.633	1.450.633	1.450.633	1.450.633	1.450.633	1.450.633	1.450.633	1.450.633	1.450.633	1.450.633	1.450.633	1.450.633	1.450.633	29.737.970
Zinserträge	0	7.798	16.496	22.771	23.232	20.401	17.212	13.692	10.318	8.484	6.803	6.369	8.080	10.055	12.291	10.939	8.663	9.769	10.704	10.696	10.546	245.320
Erträge gesamt	**725.316**	**1.458.431**	**1.467.128**	**1.473.404**	**1.473.865**	**1.471.034**	**1.467.845**	**1.464.325**	**1.460.951**	**1.459.117**	**1.457.435**	**1.457.001**	**1.458.713**	**1.460.688**	**1.462.924**	**1.461.572**	**1.459.296**	**1.460.402**	**1.461.337**	**1.461.329**	**1.461.178**	**29.983.290**
Aufwendungen																						
Entschädigung für Ertragsminderung (Ohne alt) *1	139.428	139.428	139.428	139.428	139.428	139.428	139.428	139.428	0	0	0	0	0	0	0	0	0	0	0	0	0	1.115.423
Strombezug	1.500	3.000	3.090	3.183	3.278	3.377	3.478	3.582	3.690	3.800	3.914	4.032	4.153	4.277	4.406	4.538	4.674	4.814	4.959	5.107	5.261	82.111
Pachtaufwendungen inkl. Festbetrag *2	30.138	60.275	60.275	60.275	60.275	60.275	60.275	60.275	60.275	60.275	60.275	74.782	74.782	74.782	74.782	74.782	74.782	74.782	74.782	74.782	74.782	1.380.707
Enercon-Partner-Konzept *3	0	0	48.410	96.820	99.725	157.067	211.417	217.760	224.292	231.021	237.952	245.090	252.443	260.016	267.817	413.777	426.190	438.976	452.145	465.710	479.681	5.226.312
Versicherungen	6.000	12.000	12.360	12.731	13.113	13.506	13.911	14.329	14.758	15.201	15.657	16.127	16.611	17.109	17.622	18.151	18.696	19.256	19.834	20.429	21.042	328.444
Komplementärvergütung	2.500	2.500	2.500	2.500	2.500	2.500	2.500	2.500	2.500	2.500	2.500	2.500	2.500	2.500	2.500	2.500	2.500	2.500	2.500	2.500	2.500	52.500
Verwaltung/Geschäftsf./ techn. Überwachung	36.266	72.532	73.620	74.724	75.845	76.982	78.137	79.309	80.499	81.706	82.932	84.176	85.439	86.720	88.021	89.341	90.681	92.042	93.422	94.824	96.246	1.713.463
Steuerberatung / Jahresbilanz	6.000	6.000	6.180	6.365	6.556	6.753	6.956	7.164	7.379	7.601	7.829	8.063	8.305	8.555	8.811	9.076	9.348	9.628	9.917	10.215	10.521	167.222
Rückstellung für Rückbau *4	27.000	27.000	27.000	27.000	27.000	27.000	27.000	27.000	27.000	27.000	27.000	27.000	27.000	27.000	27.000	27.000	27.000	27.000	27.000	27.000	0	540.000
Abschreibung	455.575	911.151	911.151	911.151	911.151	911.151	911.151	911.151	911.151	911.151	911.151	911.151	911.151	911.151	911.151	911.151	455.575	0	0	0	0	14.578.410
Sonstiges	7.500	15.000	15.005	15.009	15.014	15.018	15.023	15.027	15.032	15.036	15.041	15.045	15.050	15.054	15.059	15.063	15.068	15.072	15.077	15.081	15.086	308.357
Zinsaufwand ab Fertigstellung	135.750	271.500	269.500	259.177	238.208	212.917	187.625	162.333	137.042	111.750	176.917	138.333	103.750	69.167	34.583	8.646	0	0	0	0	0	2.517.198
Avalprovision	2.000	4.000	4.000	4.000	4.000	4.000	4.000	4.000	4.000	4.000	4.000	4.000	4.000	4.000	4.000	4.000	4.000	4.000	4.000	4.000	4.000	82.000
Aufwendungen vor Gewerbesteuer	**849.657**	**1.524.385**	**1.572.518**	**1.612.363**	**1.596.093**	**1.629.974**	**1.660.900**	**1.643.858**	**1.487.618**	**1.471.042**	**1.545.167**	**1.530.299**	**1.505.182**	**1.480.331**	**1.455.751**	**1.578.024**	**1.128.514**	**688.070**	**703.636**	**719.647**	**709.118**	**28.092.147**
Gewerbesteuer (siehe Berechnung)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2.776	82.118	80.324	81.487	246.705
Aufwendungen inkl. Gewerbesteuer	849.657	1.524.385	1.572.518	1.612.363	1.596.093	1.629.974	1.660.900	1.643.858	1.487.618	1.471.042	1.545.167	1.530.299	1.505.182	1.480.331	1.455.751	1.578.024	1.128.514	690.846	785.754	799.972	790.605	28.338.853
Jahresgewinn / Verlust	**-124.340**	**-65.954**	**-105.390**	**-138.959**	**-122.228**	**-158.939**	**-193.055**	**-179.533**	**-26.667**	**-11.925**	**-87.732**	**-73.298**	**-46.469**	**-19.643**	**7.173**	**-116.452**	**330.782**	**772.332**	**757.701**	**741.681**	**752.060**	**1.891.143**

Liquiditätsprognose																						
Jahresgewinn / Verlust	-124.340	-65.954	-105.390	-138.959	-122.228	-158.939	-193.055	-179.533	-26.667	-11.925	-87.732	-73.298	-46.469	-19.643	7.173	-116.452	330.782	772.332	757.701	741.681	752.060	1.891.143
zzgl. Zuführung Rückstellung	27.000	27.000	27.000	27.000	27.000	27.000	27.000	27.000	27.000	27.000	27.000	27.000	27.000	27.000	27.000	27.000	27.000	27.000	27.000	27.000	0	540.000
zzgl. Abschreibung	455.575	911.151	911.151	911.151	911.151	911.151	911.151	911.151	911.151	911.151	911.151	911.151	911.151	911.151	911.151	911.151	455.575	0	0	0	0	14.578.410
zzgl. "finanzierte" Liquiditätsreserve	421.590																					421.590
abzgl. einbehaltene Zinsabschlagsteuer	0	-2.468	-5.221	-7.207	-7.353	-6.457	-5.448	-4.334	-3.266	-2.685	-2.153	-2.016	-2.557	-3.182	-3.890	-3.462	-2.742	-3.092	-3.388	-3.385	-3.338	-77.644
abzgl. GewSt	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-2.776	-82.118	-80.324	-81.487	-246.705
abzgl. Tilgung	0	0	-200.000	-745.833	-1.091.667	-1.091.667	-1.091.667	-1.091.667	-1.091.667	-1.091.667	-891.667	-691.667	-691.667	-691.667	-691.667	-345.833	0	0	0	0	0	-11.500.000
abzgl. Rückbaukosten inkl. Sanierung	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-540.000	-540.000
abzgl. Ausschüttungen	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**-385.000**	**-700.000**	**-700.000**	**-700.000**	**-700.000**	**-700.000**	**-1.172.500**	**-5.057.500**
Ausschüttung in % zum EK	**0,00%**	**0,00%**	**0,00%**	**0,00%**	**0,00%**	**0,00%**	**0,00%**	**0,00%**	**0,00%**	**0,00%**	**0,00%**	**0,00%**	**0,00%**	**0,00%**	**11,00%**	**20,00%**	**20,00%**	**20,00%**	**20,00%**	**20,00%**	**33,50%**	**144,50%**
Liquiditätsüberschuss	779.825	869.728	627.540	46.151	-283.097	-318.912	-352.019	-337.383	-183.449	-168.126	-43.401	171.170	197.457	223.659	-135.233	-227.597	110.616	93.464	-805	-15.028	-1.045.264	9.294
Liquiditätsreserve vor Verpfändung	**779.825**	**1.649.553**	**2.277.093**	**2.323.244**	**2.040.147**	**1.721.235**	**1.369.216**	**1.031.833**	**848.384**	**680.258**	**636.857**	**808.027**	**1.005.484**	**1.229.143**	**1.093.909**	**866.312**	**976.928**	**1.070.391**	**1.069.586**	**1.054.558**	**9.294**	
Einzahlung auf Rückbaukonto	*27.000*	*27.000*	*27.000*	*27.000*	*27.000*	*27.000*	*27.000*	*27.000*	*27.000*	*27.000*	*27.000*	*27.000*	*27.000*	*27.000*	*27.000*	*27.000*	*27.000*	*27.000*	*27.000*	*27.000*	*0*	540.000
Verpfändung Rückbau (kummuliert)	27.000	54.000	81.000	108.000	135.000	162.000	189.000	216.000	243.000	270.000	297.000	324.000	351.000	378.000	405.000	432.000	459.000	486.000	513.000	540.000	0	
40 % Kapitaldienst Folgejahr (verpfändet)	0	0	402.004	531.950	521.833	511.717	501.600	491.483	481.367	427.433	332.000	318.167	304.333	290.500	141.792	0	0	0	0	0	0	
Liquiditätsreserve nach Verpfändung	**752.825**	**1.595.553**	**1.794.089**	**1.683.294**	**1.383.314**	**1.047.518**	**678.616**	**324.349**	**124.017**	**-17.176**	**7.857**	**165.860**	**350.151**	**560.643**	**547.118**	**434.312**	**517.928**	**584.391**	**556.586**	**514.558**	**9.294**	
Cash Flow	*915.575*	*1.141.228*	*1.097.040*	*1.051.161*	*1.046.778*	*985.671*	*927.273*	*916.617*	*1.045.260*	*1.035.290*	*1.025.182*	*1.001.170*	*992.874*	*984.492*	*976.017*	*826.882*	*810.616*	*793.464*	*699.195*	*684.972*	*127.236*	
Kapitaldienst	*135.750*	*271.500*	*469.500*	*1.005.010*	*1.329.875*	*1.304.583*	*1.279.292*	*1.254.000*	*1.228.708*	*1.203.417*	*1.068.583*	*830.000*	*795.417*	*760.833*	*726.250*	*354.479*	*0*	*0*	*0*	*0*	*0*	
DSCR 0,00	*674%*	*420%*	*234%*	*105%*	*79%*	*76%*	*72%*	*73%*	*85%*	*86%*	*96%*	*121%*	*125%*	*129%*	*134%*	*233%*						

Zins- und Tilgungsplan	0,5	1,5	2,5	3,5	4,5	5,5	6,5	7,5	8,5	9,5	10,5	11,5	12,5	13,5	14,5	15,5	16,5	17,5	18,5	19,5	20,5	
	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	
Kfw "Erneuer 3.200.000																						
Laufzeit: 10,00 Jahre Tilgung	0	0	200.000	400.000	400.000	400.000	400.000	400.000	400.000	400.000	200.000	0	0	0	0	0	0	0	0	0	0	3.200.000
Tilgungsfrei: 2,00 Jahre Tilgung kum.	0	0	200.000	600.000	1.000.000	1.400.000	1.800.000	2.200.000	2.600.000	3.000.000	3.200.000	3.200.000	3.200.000	3.200.000	3.200.000	3.200.000	3.200.000	3.200.000	3.200.000	3.200.000	3.200.000	
Zinssatz: 2,00 % Zinsen	32.000	64.000	62.000	56.000	48.000	40.000	32.000	24.000	16.000	8.000	2.000	0	0	0	0	0	0	0	0	0	0	384.000
Kfw "Erneuer 8.300.000																						
Laufzeit: 15,00 Jahre Tilgung	0	0	0	345.833	691.667	691.667	691.667	691.667	691.667	691.667	691.667	691.667	691.667	691.667	691.667	345.833	0	0	0	0	0	8.300.000
Tilgungsfrei: 3,00 Jahre Tilgung kum.	0	0	0	345.833	1.037.500	1.729.167	2.420.833	3.112.500	3.804.167	4.495.833	5.187.500	5.879.167	6.570.833	7.262.500	7.954.167	8.300.000	8.300.000	8.300.000	8.300.000	8.300.000	8.300.000	
Zinssatz: 2,50 % Zinsen	103.750	207.500	207.500	203.177	190.208	172.917	155.625	138.333	121.042	103.750	86.458	69.167	51.875	34.583	17.292	4.323	0	0	0	0	0	1.867.500
Euribor 0																						
Laufzeit: 3,00 Jahre Tilgung	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tilgungsfrei: 0,00 Jahre Tilgung kum.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Zinssatz: 2,25 % Zinsen	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Berechnung der GewSt																						
	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	
Ergebnis vor Steuer	-124.340	-65.954	-105.390	-138.959	-122.228	-158.939	-193.055	-179.533	-26.667	-11.925	-87.732	-73.298	-46.469	-19.643	7.173	-116.452	330.782	772.332	757.701	741.681	752.060	1.891.143
Darlehenszinsen / Disagio 100%	*271.500*	*271.500*	*269.500*	*259.177*	*238.208*	*212.917*	*187.625*	*162.333*	*137.042*	*111.750*	*176.917*	*138.333*	*103.750*	*69.167*	*34.583*	*8.646*	*0*	*0*	*0*	*0*	*0*	
Pachten 50%	*15.069*	*30.138*	*30.138*	*30.138*	*30.138*	*30.138*	*30.138*	*30.138*	*30.138*	*30.138*	*30.138*	*37.391*	*37.391*	*37.391*	*37.391*	*37.391*	*37.391*	*37.391*	*37.391*	*37.391*	*37.391*	
Zwischensumme	*286.569*	*301.638*	*299.638*	*289.315*	*268.346*	*243.054*	*217.763*	*192.471*	*167.179*	*141.888*	*207.054*	*175.724*	*141.141*	*106.557*	*71.974*	*46.037*	*37.391*	*37.391*	*37.391*	*37.391*	*37.391*	
abzüglich Freibetrag 100.000 €	*186.569*	*201.638*	*199.638*	*189.315*	*168.346*	*143.054*	*117.763*	*92.471*	*67.179*	*41.888*	*107.054*	*75.724*	*41.141*	*6.557*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	
Hinzurechnung 25%	46.642	50.409	49.909	47.329	42.086	35.764	29.441	23.118	16.795	10.472	26.764	18.931	10.285	1.639	0	0	0	0	0	0	0	
Hinzurechnung Vorlaufkosten	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
gewst. Ergebnis	-77.698	-15.545	-55.480	-91.631	-80.141	-123.176	-163.615	-156.416	-9.872	-1.453	-60.968	-54.367	-36.184	-18.004	7.173	-116.452	330.782	772.332	757.701	741.681	752.060	
Verlustvortrag		-77.698	-93.243	-148.724	-240.354	-320.495	-443.671	-607.286	-763.701	-773.573	-775.027	-835.995	-890.362	-926.546	-944.550	-937.377	-1.053.829	-723.047	0	0	0	
Verlustfeststellung	-77.698	-93.243	-148.724	-240.354	-320.495	-443.671	-607.286	-763.701	-773.573	-775.027	-835.995	-890.362	-926.546	-944.550	-937.377	-1.053.829	-723.047	49.284	757.701	741.681	752.060	
./. Freibetrag (24.500)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-24.500	-24.500	-24.500	-24.500	
zu versteuerndes Ergebnis	**-77.698**	**-93.243**	**-148.724**	**-240.354**	**-320.495**	**-443.671**	**-607.286**	**-763.701**	**-773.573**	**-775.027**	**-835.995**	**-890.362**	**-926.546**	**-944.550**	**-937.377**	**-1.053.829**	**-723.047**	**24.784**	**733.201**	**717.181**	**727.560**	**-8.352.753**
Hebesatz 320%																						
Gewerbesteuer Messbetrag 3,5%	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	867	25.662	25.101	25.465	
Gewerbeertragsteuer gesamt	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**2.776**	**82.118**	**80.324**	**81.487**	**246.705**

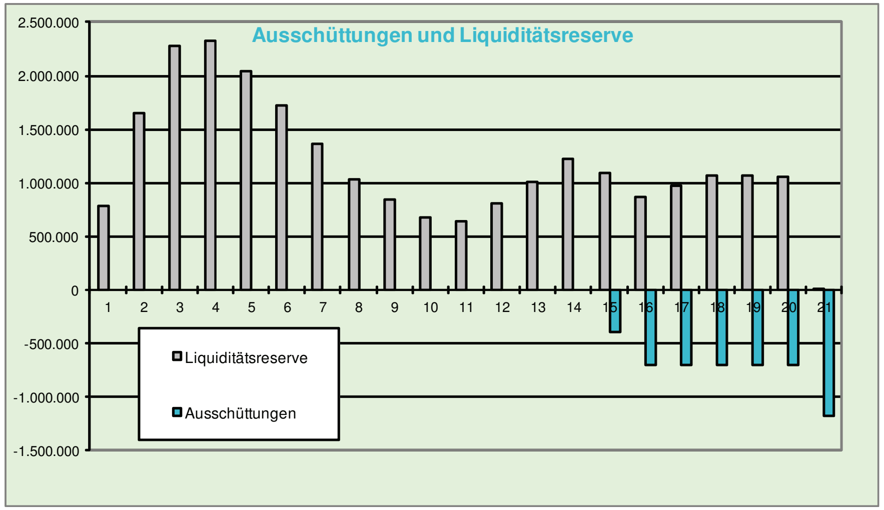
Abschreibungen	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	kum.
Sonder-AfA § 7g EStG in %	0,0%	0,0%	0,0%	0,0%	0,0%																	
in €	0	0	0	0	0																	0
AK (lin) 14.578.409,94 €																						
ND in Jahren **16 Jahre**																						
AfA-Satz 6,25%																						
Abschreibung in Euro	455.575	911.151	911.151	911.151	911.151	911.151	911.151	911.151	911.151	911.151	911.151	911.151	911.151	911.151	911.151	911.151	455.575					14.578.410
Restbuchwert	14.122.835	13.211.684	12.300.533	11.389.383	10.478.232	9.567.082	8.655.931	7.744.780	6.833.630	5.922.479	5.011.328	4.100.178	3.189.027	2.277.877	1.366.726	455.575	0	0	0	0	0	

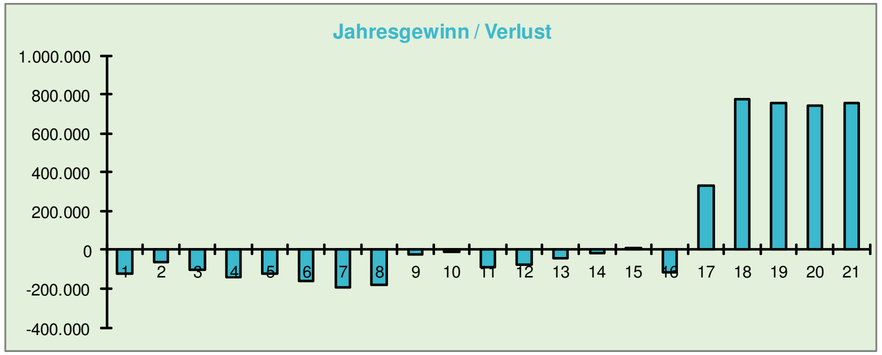
*1 Neue Anlagen verursachen Abschattung und mindern den Ertrag der alten Ohne- Anlagen, somit 8 %ige Entschädigung des entgangenen Ertrags
*2 Laut neuen Pachtverträgen max. zu versiegelnde Fläche = 4.000 m² bei 0,25 € pro m². Im Schnitt wird mit 750 € pro WEA gerechnet
*4 Als Rückstellung sind 60.000 € pro MW vorgesehen. Bei 3 MW per WEA (3) errechnet sich eine Gesamtrückstellung von 540.000 € berechnet auf 20 Jahre

Appendix H-2

Financial Ratios and Diagrams E-101 WP Ohne Expansion

Kennzahlen	in %	in €
Investitionskosten pro kWh		0,95 €
Barausschüttungen kummuliert	144,50%	5.057.500,00 €
Überschuss/Jahr (vor Steuern)	2,23%	





Appendix I-2

Investment GE 2.5 WP Ohne Expansion

Anzahl WEA	**3**	**1**
GE 2.5-120 inkl. Trafo/Fundament		
Ausgleichsmaßnahmen		
Projektierung		
Zinsen / Bereitstellung / Aval bis IB		
ext./int Verk., Netzanb., Ü-Station		
UW- Erweiterung/Errichtung (Umspannwerk)	- €	- €
Erschließung / Wegebau		
Sondernutzungsrecht Gemeinde		
Sonstiges (Gutachten/Telefon/Gebühren usw.)		
Verwaltung / Überwachung / GF bis IB		
Kauf Repowering-Ansprüche	520.958,01 €	173.652,67 €
	12.185.958,01 €	**4.061.986,00 €**

Angebotspreis GE 2.5-120 NH 110m Stand: 13. Feb 13

Einzelpositionen	**Einzelrichtpreis**	**Angebot**
Grundpreis Anlage	-	
FACTS-Leistungsmerkmale	-	inkl.
Q+-Option	-	inkl.
Tageskennzeichnung rot/grau/rot	-	inkl.
Nachtkennzeichnung W-Rot	-	inkl.
Turmbefeuerung	-	inkl.
Tiefgründungsfundament mit Pfahllänge bis 20m	-	inkl.
Flachgründungsfundament mit Auftriebsicherung	-	
Gesamt		

Appendix J-2

Repowering-Bonus GE 2.5 WP Ohne Expansion

Barwertberechnung / Kapitalwertberechnung

Repowering-Bonus

Jahr	Perioden (n)	Repowering- Bonus (K_1)	Wiederanlagezins (p) *1	Barwert in € (K_0) *2
2014	0,5	14.013	0,0507	13.671
2015	1,5	28.026	0,0507	26.022
2016	2,5	28.026	0,0507	24.766
2017	3,5	28.026	0,0507	23.571
2018	4,5	28.026	0,0507	22.434
…	…	…	…	…
2034	20,5	14.013	0,0507	5.084
kum.		**560.515**		**347.305**

Annahmen:			
	Energieprognose	5.719.542	kWh/Jahr
	Wiederanlagezins (p)	5,07	%
	Repowering- Bonus	0,49	€Cent/kWh
	Anlagezeitraum (n)	20	Jahre

Repowering- Bonus pro WEA gesplittet (€): **173.653**

*1 gemäß Abzinsungszinssatztabelle der Deutsche Bundesbank vom 31.03.2013

*2 Formel: $K_0 = K_1/(1+p)^n$

Detailrechnung

Jahr	Periode	Bonus	Barwert
2014	0,5	14.013	13.671
2015	1,5	28.026	26.022
2016	2,5	28.026	24.766
2017	3,5	28.026	23.571
2018	4,5	28.026	22.434
2019	5,5	28.026	21.351
2020	6,5	28.026	20.321
2021	7,5	28.026	19.340
2022	8,5	28.026	18.407
2023	9,5	28.026	17.519
2024	10,5	28.026	16.674
2025	11,5	28.026	15.869
2026	12,5	28.026	15.103
2027	13,5	28.026	14.375
2028	14,5	28.026	13.681
2029	15,5	28.026	13.021
2030	16,5	28.026	12.392
2031	17,5	28.026	11.795
2032	18,5	28.026	11.225
2033	19,5	28.026	10.684
2034	20,5	14.013	5.084
		560.515	**347.305**

Appendix K-2

Investment Plan GE 2.5 WP Ohne Expansion

W n E GmbH
Große Straße 14
26871 Aschendorf

Gesellschaften:		
WP Ohne (Erweiterung)	Datum der Bearbeitung:	13.02.2013
	Bearbeiter:	S. Jansen
	Gründungsjahr:	2014

Investitionsplan	in %	in Euro	AfA-Zeitraum
GE-2.5-120 inkl. Trafo / Fundament			
Verwaltung / GF bis IB			
Ausgleichsmaßnahmen			
Standorte / UVP / Bimsch-Gen.			
Zinsen, Bereitstellung, Aval bis IB			
ext./int Verk., Netzanb., Ü-Station			
Erschließung / Wegebau			
Projektentwicklung/Rechtsberatung			
Sondernutzungsrecht Gemeinde			
Sonstiges (Gutachten/Telefon/Gebühren usw.)			
Zwischensumme	**96,71%**	**12.185.958,01 €**	
Liquiditäts- / Kostenreserve	**3,29%**	**414.041,99 €**	**kein Aufwand**
Disagio	**0,0%**	**- €**	**15 Jahre**
Summe Investitionskosten	**100,0%**	**12.600.000,00 €**	

Parkdaten				
Standort	**Ohne**		Aufstelljahr	**2014**
WKA- Typ	**GE 2.5-120**		Inbetriebnahme	**Juli**
Nabenhöhe	**110 m**		Monate im IB-Jahr	**6**
Rotordurchmesser	**120 m**			
Wind in Narbenhöhe	**6,09 m/s**	(lt. anemos)		
WEA-Anzahl	**3**			

Finanzierungsplan				
Fremdkapital				
Kfw "Erneuerbare Energie"				
Betrag	**28,57%**	3.600.000,00 €		
Tilgungsfrei		2,0 Jahre		
Zinssatz		2,00 %		
Laufzeit		10 Jahre		
Kfw "Erneuerbare Energie"				
Betrag	**47,62%**	6.000.000,00 €	Disagio	- €
Tilgungsfrei		3,0 Jahre		
Zinssatz		2,50 %		
Laufzeit		15 Jahre		
Euribor				
Betrag	**0,00%**	- €		
Tilgungsfrei		0,0 Jahre		
Zinssatz		2,25 %		
Laufzeit		3 Jahre		
Eigenkapital				
Kommanditisten	**23,81%**	**3.000.000,00 €**		
Summe Finanzierung	**100,00%**	**12.600.000,00 €**		

Laufende Erträge			
Energieprognose (nach Parkwirkung) *1		**19.052.440 kWh** (lt. anemos)	
abzgl. Parkwirkung (siehe oben)	0,00%	0 kWh	**19.052.440 kWh**
abzgl. Verfügbarkeitsabschlag	3,00%	571.573 kWh	18.480.867 kWh
abzgl. Leitungsverluste	2,00%	369.617 kWh	18.111.249 kWh
abzgl. Schatten/Eis	0,00%	0 kWh	18.111.249 kWh
abzgl. Sicherheit	5,00%	952.622 kWh	**17.158.627 kWh**
Einspeisevergütung pro KWh *2	für	20 volle Jahre	0,0915 € pro KWh
Einspeisevergütung gesamt			**1.570.014,41 €**
		danach	0,0000 € pro KWh
			- €
Überziehungszinssatz	5,00%		
Kontokorrent Zinssatz für Guthaben	1,00%		

Allgemeine Daten		
Gewerbesteuerhebesatz		320%
Darlehen	anteilig	0,5

Laufender Aufwand		ab 1. volles Jahr		ab 3. volles Jahr		ab 6. volles Jahr		ab 11. volles Jahr	Steig. in %
Strombezug		6.000,00 €		6.365,40 €		6.955,64 €		8.063,50 €	3,00%
Entschädigung für Ertrags-minderung (Ohne alt)		139.427,84 €		139.427,84 €		139.427,84 €		- €	
Vollabsicherung GE		219.000,00 €		232.337,10 €		253.881,02 €		294.317,69 €	3,00%
Pachtaufwand inkl. Festbetrag	4%	65.050,58 €	4%	65.050,58 €	4%	65.050,58 €	5%	80.750,72 €	
Verwaltung/Geschäftsf./ techn. Überwachung		78.500,72 €		80.873,40 €		84.567,57 €		91.103,29 €	1,50%
Haftpflichtversicherung		300,00 €		318,27 €		347,78 €		403,17 €	3,00%
Maschinenbruch-/ BU-Vers.		11.700,00 €		12.412,53 €		13.563,51 €		15.723,82 €	3,00%
Komplementärvergütung		2.500,00 €		2.500,00 €		2.500,00 €		2.500,00 €	
Steuerberatung / Jahresbilanz		6.000,00 €		6.365,40 €		6.955,64 €		8.063,50 €	3,00%
Sonstiges		15.000,00 €		15.009,00 €		15.022,51 €		15.045,06 €	3,00%
Zinsaufwand ab Fertigstellung		222.000,00 €		209.875,00 €		148.500,00 €		100.000,00 €	
Überziehungszinsen		- €		- €		- €		- €	
Gewerbesteuer		- €		4.688,42 €		6.371,44 €		17.978,68 €	
Avalprovision		4.000,00 €		4.000,00 €		4.000,00 €		4.000,00 €	
Gründungskosten "Afa"		- €		- €		- €		- €	
Disagio		- €		- €		- €		- €	15 Jahre
Rückstellung für Rückbau		22.500,00 €		22.500,00 €		22.500,00 €		22.500,00 €	
Abschreibung		761.622,38 €		761.622,38 €		761.622,38 €		761.622,38 €	16 Jahre
Summe Aufwand		**1.553.601,51 €**		**1.563.345,32 €**		**1.531.265,91 €**		**1.422.071,81 €**	

*1 Lt. anemos Wahrscheinlichkeit P75 (75%) 101.612,9 MWh/Jahr für 16 WEA - Umrechnung auf 3 WEA
*2 Im Jahr 2014 Anfangsvergütung 8,66 € pro kWh zzgl. 0,49 €/Cent Repowering-Bonus

Appendix L-2

Profit and Loss Forecast GE 2.5 WP Ohne Expansion

Ergebnisprognose	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	
	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	kum.
Erträge																						
Einspeisevergütung	785.007	1.570.014	1.570.014	1.570.014	1.570.014	1.570.014	1.570.014	1.570.014	1.570.014	1.570.014	1.570.014	1.570.014	1.570.014	1.570.014	1.570.014	1.570.014	1.570.014	1.570.014	1.570.014	1.570.014	1.570.014	32.185.295
Zinserträge	0	6.803	14.255	19.403	19.844	17.876	16.012	13.350	10.783	9.548	8.412	9.009	8.891	8.902	9.038	9.292	10.635	10.210	9.196	8.013	6.654	226.127
Erträge gesamt	**785.007**	**1.576.818**	**1.584.270**	**1.589.418**	**1.589.858**	**1.587.890**	**1.586.026**	**1.583.364**	**1.580.798**	**1.579.563**	**1.578.427**	**1.579.023**	**1.578.905**	**1.578.917**	**1.579.053**	**1.579.306**	**1.580.649**	**1.580.224**	**1.579.211**	**1.578.027**	**1.576.669**	**32.411.423**
Aufwendungen																						
Entschädigung für Ertragsminderung (Ohne alt) *1	139.428	139.428	139.428	139.428	139.428	139.428	139.428	139.428	0	0	0	0	0	0	0	0	0	0	0	0	0	1.115.423
Strombezug	3.000	6.000	6.180	6.365	6.556	6.753	6.956	7.164	7.379	7.601	7.829	8.063	8.305	8.555	8.811	9.076	9.348	9.628	9.917	10.215	10.521	164.222
Pachtaufwendungen inkl. Festbetrag *2	32.525	65.051	65.051	65.051	65.051	65.051	65.051	65.051	65.051	65.051	65.051	80.751	80.751	80.751	80.751	80.751	80.751	80.751	80.751	80.751	80.751	1.490.538
Vollabsicherung GE *3	109.500	219.000	225.570	232.337	239.307	246.486	253.881	261.497	269.342	277.423	285.745	294.318	303.147	312.242	321.609	496.886	511.792	527.146	542.960	559.249	576.027	7.065.466
Versicherungen	6.000	12.000	12.360	12.731	13.113	13.506	13.911	14.329	14.758	15.201	15.657	16.127	16.611	17.109	17.622	18.151	18.696	19.256	19.834	20.429	21.042	328.444
Komplementärvergütung	2.500	2.500	2.500	2.500	2.500	2.500	2.500	2.500	2.500	2.500	2.500	2.500	2.500	2.500	2.500	2.500	2.500	2.500	2.500	2.500	2.500	52.500
Verwaltung/Geschäftsf./ techn. Überwachung	39.250	78.501	79.678	80.873	82.087	83.318	84.568	85.836	87.124	88.430	89.757	91.103	92.470	93.857	95.265	96.694	98.144	99.616	101.111	102.627	104.167	1.854.475
Steuerberatung / Jahresbilanz	6.000	6.000	6.180	6.365	6.556	6.753	6.956	7.164	7.379	7.601	7.829	8.063	8.305	8.555	8.811	9.076	9.348	9.628	9.917	10.215	10.521	167.222
Rückstellung für Rückbau *4	22.500	22.500	22.500	22.500	22.500	22.500	22.500	22.500	22.500	22.500	22.500	22.500	22.500	22.500	22.500	22.500	22.500	22.500	22.500	22.500	0	450.000
Abschreibung	380.811	761.622	761.622	761.622	761.622	761.622	761.622	761.622	761.622	761.622	761.622	761.622	761.622	761.622	761.622	761.622	380.811	0	0	0	0	12.185.958
Sonstiges	7.500	15.000	15.005	15.009	15.014	15.018	15.023	15.027	15.032	15.036	15.041	15.045	15.050	15.054	15.059	15.063	15.068	15.072	15.077	15.081	15.086	308.357
Zinsaufwand ab Fertigstellung	111.000	222.000	219.750	209.875	191.500	170.000	148.500	127.000	105.500	84.000	129.500	100.000	75.000	50.000	25.000	6.250	0	0	0	0	0	1.974.875
Avalprovision	2.000	4.000	4.000	4.000	4.000	4.000	4.000	4.000	4.000	4.000	4.000	4.000	4.000	4.000	4.000	4.000	4.000	4.000	4.000	4.000	4.000	82.000
Aufwendungen vor Gewerbesteuer	**862.015**	**1.553.602**	**1.559.824**	**1.558.657**	**1.549.233**	**1.536.935**	**1.524.894**	**1.513.119**	**1.362.187**	**1.350.965**	**1.407.030**	**1.404.093**	**1.390.261**	**1.376.744**	**1.363.550**	**1.522.568**	**1.152.957**	**790.098**	**808.567**	**827.567**	**824.614**	**27.239.480**
Gewerbesteuer (siehe Berechnung)	0	0	4.258	4.688	5.279	5.834	6.371	6.790	22.805	23.322	18.189	17.979	18.815	19.899	21.392	3.611	45.158	85.750	83.568	81.308	81.486	556.501
Aufwendungen inkl. Gewerbesteuer	862.015	1.553.602	1.564.081	1.563.345	1.554.512	1.542.769	1.531.266	1.519.909	1.384.993	1.374.286	1.425.219	1.422.072	1.409.076	1.396.643	1.384.942	1.526.179	1.198.115	875.848	892.135	908.874	906.100	27.795.981
Jahresgewinn / Verlust	**-77.007**	**23.216**	**24.446**	**30.761**	**40.625**	**50.955**	**61.132**	**70.246**	**218.610**	**228.598**	**171.396**	**174.930**	**188.644**	**202.173**	**215.502**	**56.739**	**427.692**	**790.126**	**770.644**	**750.461**	**752.055**	**5.171.943**

Liquiditätsprognose																						
Jahresgewinn / Verlust	-77.007	23.216	24.446	30.761	40.625	50.955	61.132	70.246	218.610	228.598	171.396	174.930	188.644	202.173	215.502	56.739	427.692	790.126	770.644	750.461	752.055	5.171.943
zzgl. Zuführung Rückstellung	22.500	22.500	22.500	22.500	22.500	22.500	22.500	22.500	22.500	22.500	22.500	22.500	22.500	22.500	22.500	22.500	22.500	22.500	22.500	22.500	0	450.000
zzgl. Abschreibung	380.811	761.622	761.622	761.622	761.622	761.622	761.622	761.622	761.622	761.622	761.622	761.622	761.622	761.622	761.622	761.622	380.811	0	0	0	0	12.185.958
zzgl. "finanzierte" Liquiditätsreserve	414.042																					414.042
abzgl. einbehaltene Zinsabschlagsteuer	0	-2.153	-4.512	-6.141	-6.281	-5.658	-5.068	-4.225	-3.413	-3.022	-2.662	-2.851	-2.814	-2.818	-2.861	-2.941	-3.366	-3.231	-2.911	-2.536	-2.106	-71.569
abzgl. GewSt	0	0	-4.258	-4.688	-5.279	-5.834	-6.371	-6.790	-22.805	-23.322	-18.189	-17.979	-18.815	-19.899	-21.392	-3.611	-45.158	-85.750	-83.568	-81.308	-81.486	-556.501
abzgl. Tilgung	0	0	-225.000	-700.000	-950.000	-950.000	-950.000	-950.000	-950.000	-950.000	-725.000	-500.000	-500.000	-500.000	-500.000	-250.000	0	0	0	0	0	-9.600.000
abzgl. Rückbaukosten inkl. Sanierung	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-450.000	-450.000
abzgl. Ausschüttungen	**-60.000**	**-60.000**	**-60.000**	**-60.000**	**-60.000**	**-60.000**	**-150.000**	**-150.000**	**-150.000**	**-150.000**	**-150.000**	**-450.000**	**-450.000**	**-450.000**	**-450.000**	**-450.000**	**-825.000**	**-825.000**	**-825.000**	**-825.000**	**-870.000**	**-7.530.000**
Ausschüttung in % zum EK	**2,00%**	**2,00%**	**2,00%**	**2,00%**	**2,00%**	**2,00%**	**5,00%**	**5,00%**	**5,00%**	**5,00%**	**5,00%**	**15,00%**	**15,00%**	**15,00%**	**15,00%**	**15,00%**	**27,50%**	**27,50%**	**27,50%**	**27,50%**	**29,00%**	**251,00%**
Liquiditätsüberschuss	680.346	745.185	514.799	44.054	-196.812	-186.414	-266.185	-256.647	-123.485	-113.623	59.667	-11.777	1.138	13.578	25.372	134.309	-42.520	-101.355	-118.335	-135.883	-651.538	13.873
Liquiditätsreserve vor Verpfändung	**680.346**	**1.425.531**	**1.940.330**	**1.984.384**	**1.787.572**	**1.601.158**	**1.334.972**	**1.078.325**	**954.840**	**841.216**	**900.884**	**889.106**	**890.244**	**903.822**	**929.194**	**1.063.503**	**1.020.983**	**919.628**	**801.293**	**665.410**	**13.873**	
Einzahlung auf Rückbaukonto	*37.500*	*37.500*	*37.500*	*37.500*	*37.500*	*37.500*	*37.500*	*37.500*	*37.500*	*37.500*	*37.500*	*37.500*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	450.000
Verpfändung Rückbau (kummuliert)	37.500	75.000	112.500	150.000	187.500	225.000	262.500	300.000	337.500	375.000	412.500	450.000	450.000	450.000	450.000	450.000	450.000	450.000	450.000	450.000	0	
40 % Kapitaldienst Folgejahr (verpfändet)	0	0	363.950	456.600	448.000	439.400	430.800	422.200	413.600	341.800	240.000	230.000	220.000	210.000	102.500	0	0	0	0	0	0	
Liquiditätsreserve nach Verpfändung	**642.846**	**1.350.531**	**1.463.880**	**1.377.784**	**1.152.072**	**936.758**	**641.672**	**356.125**	**203.740**	**124.416**	**248.384**	**209.106**	**220.244**	**243.822**	**376.694**	**613.503**	**570.983**	**469.628**	**351.293**	**215.410**	**13.873**	**13.873**
Cash Flow	*851.346*	*1.027.185*	*1.019.549*	*1.013.929*	*1.004.688*	*993.586*	*982.315*	*970.353*	*1.082.015*	*1.070.377*	*1.064.167*	*1.038.223*	*1.026.138*	*1.013.578*	*1.000.372*	*840.559*	*782.480*	*723.645*	*706.665*	*689.117*	*218.462*	
Kapitaldienst	*111.000*	*222.000*	*444.750*	*909.875*	*1.141.500*	*1.120.000*	*1.098.500*	*1.077.000*	*1.055.500*	*1.034.000*	*854.500*	*600.000*	*575.000*	*550.000*	*525.000*	*256.250*	*0*	*0*	*0*	*0*	*0*	
DSCR 0,00	*767%*	*463%*	*229%*	*111%*	*88%*	*89%*	*89%*	*90%*	*103%*	*104%*	*125%*	*173%*	*178%*	*184%*	*191%*	*328%*						

Zins- und Tilgungsplan			0,5	1,5	2,5	3,5	4,5	5,5	6,5	7,5	8,5	9,5	10,5	11,5	12,5	13,5	14,5	15,5	16,5	17,5	18,5	19,5	20,5	
			2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	
Kfw "Erneuerbar	**3.600.000**																							
Laufzeit:	10,00 Jahre	Tilgung	0	0	225.000	450.000	450.000	450.000	450.000	450.000	450.000	450.000	225.000	0	0	0	0	0	0	0	0	0	0	3.600.000
Tilgungsfrei:	2,00 Jahre	Tilgung kum.	0	0	225.000	675.000	1.125.000	1.575.000	2.025.000	2.475.000	2.925.000	3.375.000	3.600.000	3.600.000	3.600.000	3.600.000	3.600.000	3.600.000	3.600.000	3.600.000	3.600.000	3.600.000	3.600.000	
Zinssatz:	2,00 %	Zinsen	36.000	72.000	69.750	63.000	54.000	45.000	36.000	27.000	18.000	9.000	2.250	0	0	0	0	0	0	0	0	0	0	432.000
Kfw "Erneuerbar	**6.000.000**																							
Laufzeit:	15,00 Jahre	Tilgung	0	0	0	250.000	500.000	500.000	500.000	500.000	500.000	500.000	500.000	500.000	500.000	500.000	500.000	250.000	0	0	0	0	0	6.000.000
Tilgungsfrei:	3,00 Jahre	Tilgung kum.	0	0	0	250.000	750.000	1.250.000	1.750.000	2.250.000	2.750.000	3.250.000	3.750.000	4.250.000	4.750.000	5.250.000	5.750.000	6.000.000	6.000.000	6.000.000	6.000.000	6.000.000	6.000.000	
Zinssatz:	2,50 %	Zinsen	75.000	150.000	150.000	146.875	137.500	125.000	112.500	100.000	87.500	75.000	62.500	50.000	37.500	25.000	12.500	3.125	0	0	0	0	0	1.350.000

Berechnung der GewSt		2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	
Ergebnis vor Steuer		-77.007	23.216	24.446	30.761	40.625	50.955	61.132	70.246	218.610	228.598	171.396	174.930	188.644	202.173	215.502	56.739	427.692	790.126	770.644	750.461	752.055	5.171.943
Darlehenszinsen / Disagio	*100%*	*222.000*	*222.000*	*219.750*	*209.875*	*191.500*	*170.000*	*148.500*	*127.000*	*105.500*	*84.000*	*129.500*	*100.000*	*75.000*	*50.000*	*25.000*	*6.250*	*0*	*0*	*0*	*0*	*0*	
Pachten	*50%*	*16.263*	*32.525*	*32.525*	*32.525*	*32.525*	*32.525*	*32.525*	*32.525*	*32.525*	*32.525*	*32.525*	*40.375*	*40.375*	*40.375*	*40.375*	*40.375*	*40.375*	*40.375*	*40.375*	*40.375*	*40.375*	
Zwischensumme		*238.263*	*254.525*	*252.275*	*242.400*	*224.025*	*202.525*	*181.025*	*159.525*	*138.025*	*116.525*	*162.025*	*140.375*	*115.375*	*90.375*	*65.375*	*46.625*	*40.375*	*40.375*	*40.375*	*40.375*	*40.375*	
abzüglich Freibetrag 100.000 €		*138.263*	*154.525*	*152.275*	*142.400*	*124.025*	*102.525*	*81.025*	*59.525*	*38.025*	*16.525*	*62.025*	*40.375*	*15.375*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	
Hinzurechnung	25%	34.566	38.631	38.069	35.600	31.006	25.631	20.256	14.881	9.506	4.131	15.506	10.094	3.844	0	0	0	0	0	0	0	0	
Hinzurechnung Vorlaufkosten		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
gewst. Ergebnis		-42.442	61.848	62.515	66.361	71.631	76.586	81.388	85.127	228.117	232.730	186.903	185.024	192.488	202.173	215.502	56.739	427.692	790.126	770.644	750.461	752.055	
Verlustvortrag		0	-42.442	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Verlustfeststellung		-42.442	19.406	62.515	66.361	71.631	76.586	81.388	85.127	228.117	232.730	186.903	185.024	192.488	202.173	215.502	56.739	427.692	790.126	770.644	750.461	752.055	
./. Freibetrag (24.500)		0	-24.500	-24.500	-24.500	-24.500	-24.500	-24.500	-24.500	-24.500	-24.500	-24.500	-24.500	-24.500	-24.500	-24.500	-24.500	-24.500	-24.500	-24.500	-24.500	-24.500	
zu versteuerndes Ergebnis		**-42.442**	**-5.094**	**38.015**	**41.861**	**47.131**	**52.086**	**56.888**	**60.627**	**203.617**	**208.230**	**162.403**	**160.524**	**167.988**	**177.673**	**191.002**	**32.239**	**403.192**	**765.626**	**746.144**	**725.961**	**727.555**	**4.921.224**
Hebesatz	320%																						
Gewerbesteuer Messbetrag	3,5%	0	0	1.331	1.465	1.650	1.823	1.991	2.122	7.127	7.288	5.684	5.618	5.880	6.219	6.685	1.128	14.112	26.797	26.115	25.409	25.464	
Gewerbeertragsteuer gesamt		**0**	**0**	**4.258**	**4.688**	**5.279**	**5.834**	**6.371**	**6.790**	**22.805**	**23.322**	**18.189**	**17.979**	**18.815**	**19.899**	**21.392**	**3.611**	**45.158**	**85.750**	**83.568**	**81.308**	**81.486**	**556.501**

Abschreibungen		0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
		2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	kum.
Sonder-AfA	§ 7g EStG in %	0,0%	0,0%	0,0%	0,0%	0,0%																	
	in €	0	0	0	0	0																	0
AK (lin)	12.185.958,01 €																						
ND in Jahren	**16 Jahre**																						
AfA-Satz	6,25%																						
Abschreibung in Euro		380.811	761.622	761.622	761.622	761.622	761.622	761.622	761.622	761.622	761.622	761.622	761.622	761.622	761.622	761.622	761.622	380.811					12.185.958
Restbuchwert		11.805.147	11.043.524	10.281.902	9.520.280	8.758.657	7.997.035	7.235.413	6.473.790	5.712.168	4.950.545	4.188.923	3.427.301	2.665.678	1.904.056	1.142.434	380.811	0	0	0	0	0	

*1 Neue Anlagen verursachen Abschattung und mindern den Ertrag der alten Ohne- Anlagen, somit 8 %ige Entschädigung des entgangenen Ertrags

*2 Laut neuen Pachtverträgen max. zu versiegelnde Fläche = 4.000 m² bei 0,25 € pro m². Im Schnitt wird mit 750 € pro WEA gerechnet

*4 Als Rückstellung sind 60.000 € pro MW vorgesehen. Bei 2,5 MW per WEA (3) errechnet sich eine Gesamtrückstellung von 450.000 € berechnet auf 20 Jahre

Appendix M-2

Financial Ratios and Diagrams GE 2.5 WP Ohne Expansion

Kennzahlen	in %	in €
Investitionskosten pro kWh		0,73 €
Barausschüttungen kummuliert	251,00%	7.530.000,00 €
Überschuss/Jahr (vor Steuern)	7,55%	
interner Zinsfuß (nach Steuern)	4%