

# Insurance Products' Impact on Wind Energy Investors

## Masterarbeit

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## **Abstract**

*The investment willingness for offshore wind farms is affected by funding gaps since the global financial crisis. The complex project structure and the high level of risk are the main issues in this context. Therefore, several insurance products are offered on the market to reduce these risks. Within this thesis, the main insurance products for offshore wind farms are highlighted by interviews and adjusted to a fictive German offshore wind farm. Additionally, the insurance products' impact on financial key figures is analyzed and represents how the investment willingness of investors and debt lenders is affected.*

**Key words:** *offshore wind farm, energy investors, insurance products, financial decision support system, scenario analysis*

*Seit der Finanzkrise ist der Offshore-Windmarkt von einer geringen Investitionsbereitschaft betroffen. Neben einer komplexen Projektstruktur sind hohe Risiken ein entscheidender Faktor. Um diese Risiken zu reduzieren, werden verschiedene Versicherungsprodukte am Markt angeboten. In dieser Arbeit werden die wichtigsten Versicherungsprodukte für Offshore-Windparks mittels Interviews herausgestellt und auf einen fiktiven deutschen Offshore-Windpark angepasst. Zusätzlich wird der Einfluss von einzelnen Produkten auf Finanzkennzahlen analysiert und aufgezeigt wie die Investitionsbereitschaft von Eigen- und Fremdkapitalinvestoren beeinflussen wird.*

**Schlagwörter:** *Offshore-Windpark, Energieinvestoren, Versicherungsprodukte, Finanz-Unterstützungssystem, Szenario-Analyse*

## **1 Introduction**

*“We want to end the use of nuclear energy and reach the age of renewable energy as fast as possible.”<sup>1</sup> This was the reaction of the German Chancellor Angela Merkel after the nuclear disaster of Fukushima in 2011. This incident was the final trigger to withdrawal from the nuclear energy program. The transition of the German energy sector had already started in 2002 but with an amendment of the Atomic Energy Act the government resolved in 2011 that all nuclear power stations have to be shut down until 2022.<sup>2</sup> In times of growing networks and increasing energy consumption many countries are working on several projects to be able to cover the increasing*

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<sup>1</sup> Merkel (2011).

<sup>2</sup> Cp. BMBU (2011).

demand for energy in the future without nuclear energy. Thus, there are two challenges for the energy sector: besides the increasing demand, the share of nuclear power has to be distributed to other areas. In 2011 the share of nuclear power was still 17.8% of the total German power generation but this amount was decreased to a level of 14.1% in 2015.<sup>3</sup> Besides nuclear power also the energy production by coal-fired power station has been reduced because of air pollution issues. Therefore, the government had to focus more on renewable energies. In this context, the production raised by 8% from 2012 to 2015.<sup>4</sup> As a global issue most of the European countries are working on several projects to cover the power demand by renewable energy. Until 2050 the majority of energy consumption should be covered by renewable energy. Therefore, the power supply system has to be restructured. To cover 20% of the energy consumption needs by renewable energy about 40 gigawatt (GW) are needed in 2020. For this purpose each member of the European Union has to develop a National Renewable Energy Action Plan (NREAP). It includes strategies how each member state is willing to meet the defined targets and what types of renewable technology will be used.<sup>5</sup> Hence, sources from hydropower, solar, bio, geothermal and wind energy are supported. In this context especially the wind energy sector is increasing. *“Year after year, wind-generated energy is playing a growing role in worldwide power production.”*<sup>6</sup> The share of wind energy increased during the last three years by 5.3% and equals 13.3% of the total German energy production.<sup>7</sup>

Beside onshore wind farms also the number of constructed offshore wind farms rises. The offshore wind energy market has got a high potential due to several locations that are suitable for wind farms. Therefore, the offshore wind is anticipated to be a significant factor in achieving the targets. In addition to the NREAP, the European Wind Energy Association (EWEA) developed scenarios in 2011 that simulate offshore wind energy deployment up to 2020.<sup>8</sup> Most of the member countries are lagging behind their targets for offshore wind deployment. To meet the goal of 40 GW in 2020 between €90 billion and €123 billion need to be attracted from the European offshore wind energy industry. Due to the fact that many projects have delays or have been canceled in the past, there will be a gap between the target and the realized number of GW in 2020.<sup>9</sup> In this context, the finance sector has got a key role. Governments are responsible to develop frameworks and give incentives to get more

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<sup>3</sup> Cp. IAEA (2016), p. 18.

<sup>4</sup> Cp. BMWI (2016).

<sup>5</sup> Cp. Arapogianni / Moccia (2013), p. 13.

<sup>6</sup> Swiss Re (2016).

<sup>7</sup> Cp. BMWI (2016).

<sup>8</sup> Cp. Arapogianni / Moccia (2013), p. 13.

<sup>9</sup> Cp. Arapogianni / Moccia (2013), p. 15 f.

investments and to be able to close the gap.<sup>10</sup> One incentive to minimize investment risk is the German Renewable Energy Act (EEG) that was established in 2000.<sup>11</sup> It includes subsidizations for investments and guarantees specific feed-in remunerations to the operators.

In addition to financial incentives also the size of different risks is a key factor for wind farm investments. The risk-bearing capacity plays a major part for potential investors and it is essential to consider the issue of insurability. Therefore, an in-depth risk management process is needed. To cover these risks several insurance products are offered on the market. But unfortunately, there are no researches about insurance products' impact on investors' decisions. On this account, the described problematic of the risk bearing ability is analyzed within this thesis with regard to important insurance products and their impact to wind energy investors. Within this thesis the analyses is limited to offshore wind farms, due to the fact that the size of risks is much higher than it is for onshore farms. Additionally, the opportunities are also assessed higher for offshore farms. Therefore, several aspects during an offshore wind farm (OWF) project have to be taken into account. The study is classified in the research field of Green information systems. To generate valid information about the products' importance, several actors of the OWF sector are considered. On this account, interviews are performed to get praxis data supplementary to literature information. Additionally, it is analyzed if there are further demanded insurance products that are not available yet. In this context, insurance products are analyzed in a case study with regard to their impact on financial key figures. This should clarify how the insurance products affect investment decisions.

This thesis is structured as follows: the first part represents the research background in chapter two. It provides an overview of the current state of the art and the used research design for this thesis. Chapter three is about the insurability of OWF investment risks. Therefore, several information concerning OWF projects have to be taken into account. In this context it is described which finance types are common to do OWF investments and what kind of stakeholders are involved during this process. Moreover, a risk management process is declared as a basement for a risk reduction. Subsequently, general and specific requirements for the insurability of OWF risks are presented. Chapter four constitutes the main part of this thesis. At this point interviews are designed to generate insurance information from practice. Therefore, the chosen interview method and the selected interview participants are justified. Afterwards, most important insurance products are described with their components

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<sup>10</sup> Cp. Gabriel (2015), p. VI.

<sup>11</sup> Cp. Reimelt / Sun (2015), p. 169.

and parameters on the basis of the generated data. In chapter five the mentioned insurance products are designed and adjusted to a fictive German OWF. With different scenarios, these designed insurance products are analyzed with regard to their impact on specific financial key figures. In chapter six the analyses results are discussed with regard to the used methodology and their validity. Furthermore, limitations are identified and research recommendations for further researchers and especially for OWF investors are provided. Finally, all aspects are concluded and an outlook is given in chapter seven.

## 2 Research background

Since Watson / Boudreau / Chen (2010) called for more attention to the study of Green IS, the concentration to this research field of the IS has increased over the last years.<sup>12</sup> According to Jenkin / Webster / McShane (2011) the Green IS “*refers to the development and use of information systems to support or enable environmental sustainability initiatives and, thus, tends to have an indirect and positive impact.*”<sup>13</sup> As one of the most important goals of Green IS, Watson / Boudreau / Chen (2010) mentioned the support of more supply of renewable energy production and the resulting reduction of greenhouse gas emissions.<sup>14</sup> In this context, the already mentioned analysis of OWF insurances is an additional contribution to the increasing awareness of Green IS. It is supposed to be an added value to the growing number of potential OWF investors due to the fact that it can provide a decision support for the selection of insurance products.

In the following, an overview of the current research is offered. First of all, the related work is presented with regard to the thesis topic. In this context, a literature review of existing literature is given to provide a basic understanding of current research work with summaries of the main papers and research approaches. Subsequently, on the basis of existing literature, the research question is designed. Furthermore, the research design is determined in the second part of this chapter. In this context, the working approach of the master thesis is shown.

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<sup>12</sup> Cp. Watson / Boudreau / Chen (2010), p. 20 ff.

<sup>13</sup> Jenkin / Webster / McShane (2011), p. 18 f.

<sup>14</sup> Cp. Watson / Boudreau / Chen (2010), p. 23 f.

- Additionally, the correlations between damages, insurance products and their phases should be taken into account to generate more precise information.
- A more detailed analysis of the insurance product is recommended with regard to the financial key figures. First of all, there are more values of the four key figures that can be considered (e.g. percentiles, median, max, min). In addition, there might be additional financial key figures which provide support during the analysis process.
- Moreover, it is recommended to develop and implement a cost-benefit-analysis-tool to the FDSS. In this context, the impact of several insurance products can be taken into relationship to the individual insurance cost. Thus, not only the impact can be analyzed but also the relation of the benefits and the costs.

## **7 Conclusion and Outlook**

The attention for renewable energy and the governmental support for wind energy has been increased for years and indicates the transformation of the energy system. The energy production by nuclear power and other production systems are reduced step by step to pave the way to clean energy. Since Watson / Boudreau / Chen (2010) called for more attention to the study of Green IS, the number of researches about the green sector has increased. Within this thesis wind energy by offshore wind farms is picked out as central sector of renewable energies. Due to the fact that OWF have a higher level of risk than onshore wind farms, the investment willingness for OWF is lower. Therefore, it is analyzed how risks can be reduced by insurance products and which impact these products have on investors and debt lenders for OWFs.

In order to generate the insurance products' impact on OWF investors, potential insurance products have to be determined. Due to the fact that the existing literature shows a lack of concrete product structures and design parameters, actual data are needed. Therefore, different stakeholders of the OWF business are consulted with interviews to acquire market data. On the basis of several interviews, the most important insurance products for OWFs are determined. Almost all interview participants name the CAR, DSU, OAR and BI as the most important insurance products. Especially during the construction phase the CAR is mentioned importantly due to potential cable damages. Due to the fact that the products are all risk insurances, the

CAR and the OAR cover a multiple of potential property risks. Due to the risks of damages there is also the risk of delays or interruptions. On this account, the DSU and the BI are needed to insure the OWF against financial losses due to delays or interruptions. Furthermore, the interview analysis results in additional potential insurance products that have not been used in common yet. At this point the weather-related insurance, the serial loss cover and the LoW are mentioned. Especially the LoW is revealed as an insurance product with the highest potential for future demand. Moreover, specific parameters for all mentioned insurance products are gained. The specific product information consists details about insurance rates, deductibles or periods. Due to the fact that the information could not be found in existing literature, this thesis shows a novelty and adds value for further researches. In order to analyze the products' impact on potential investors and debt lenders, the insurance products are adjusted to a fictive German OWF. With the FDSS the products are analyzed in different scenarios with regard to specific financial key figures (APV, IRR, ROE, DSCR). The analysis of the case study shows how each insurance product affects the financial key figures of the fictive German OWF. The analyzed results present that the impact is dependent on the selected product. Whereas some insurance products affect the key figures more, other products affect the key figures less. All in all, the insurance products show a low impact to the APV, IRR, ROE and DSCR for the developed scenarios. Therefore, it cannot be generalized that the insurance products lead to higher investment willingness for this case study.

Nevertheless, the low impact cannot only be traced back to the designed insurance products. Moreover, it is important to model an insurance product with a detailed structure that fits perfectly to the used case study and that all specific parameters can be modeled in a suitable decision support system. In this context, it would be necessary to modify and improve the FDSS to enable a more detailed analysis. Thus, the design of the FDSS cannot be seen as finalized and contains a high range of possible improvements. Especially the complex financial and risk structure has to be adjusted in further researches as well as the implementation of their correlations. Moreover, it can be seen as an impulse for further developments and researches about this topic. On this account, it can be concluded that the insurance sector plays an important role in the OWF sector. Moreover, further researches about insurance products of OWFs can lead to more detailed analysis results providing a more detailed support for potential investors and debt lenders.