

Incentive Driven Revenue Schemes for
Offshore Wind Farms in Brazil

Masterarbeit

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Content

<u>List of figures</u>	III
<u>List of tables</u>	IV
<u>List of symbols</u>	VII
<u>List of abbreviations</u>	VII
1. <u>Introduction</u>	1
1.1 Motivation of the Master Thesis	1
1.2 Objective and structure of the Master Thesis	2
2. <u>Remuneration systems for offshore wind farms</u>	4
2.1. <u>United Kingdom</u>	6
2.1.1 Political framework of offshore wind energy in the United Kingdom.....	6
2.1.2 Value and obligation level of the Renewable Obligation Certificates	8
2.1.3 Calculating the level of the Renewable Obligation Certificates for 2013/2014.....	10
2.1.4 The offshore remuneration system in the United Kingdom	12
2.2 <u>Sweden</u>	13
2.2.1 Political framework of offshore wind energy in Sweden.....	13
2.2.2 Quotas of Sweden	15
2.2.3 Sweden and Norway - a joint electricity certificate market	16
2.2.4 The offshore remuneration system in Sweden	16
2.3 <u>Germany</u>	18
2.3.1. Law on the sale of electricity to the grid (1991)	19
2.3.2. Renewable Energies Act (2000).....	20
2.3.3. Renewable Energies Act (2004).....	21
2.3.4. Renewable Energies Act (2009).....	22
2.3.5. Renewable Energies Act Novelle (2012)	24
2.3.6. The main offshore milestones of the offshore remuneration (1991) - (2012)	26
2.3.7. Example of developing the basic and initial offshore remuneration in course of time ..	27
2.3.8. The offshore remuneration system in Germany	27
2.4 <u>Denmark</u>	29
2.4.1 Political framework of offshore wind energy in Denmark.....	30
2.4.2 Priority and non-priority areas	31
2.4.3 The offshore remuneration system in Denmark	33
2.5 <u>Other countries</u>	34

3.	<u>Analysis, evaluation and comparison of the different offshore remuneration systems</u>	38
3.1	Analysis and evaluation of the offshore remuneration system in the United Kingdom.....	38
3.2	Analysis and evaluation of the offshore remuneration system in Sweden	41
3.3	Analysis and evaluation of the offshore remuneration system in Germany	42
3.4	Analysis and evaluation of the offshore remuneration system in Denmark.....	46
3.5	Comparison of the offshore remuneration systems	48
4.	<u>The suitable offshore remuneration system for an emerging county - a case study for Brazil.</u>	55
5.	<u>Discussion and Limitations</u>	61
6.	<u>Conclusion</u>	69
	Bibliografie.....	71

1. Introduction

1.1 Motivation of the Master Thesis

"The future of wind energy use is in the sea."¹ The key to a reducing dependency on energy imports is energy from renewable sources.² It decreases the dependence of fossil fuels like coal, oil and natural gas.³ Especially the investments in clean energy grew in the last years. In 2004, 41 billion Euro were invested in renewable energy, comparing to 197 billion Euro in 2011. Wind power is full of advantages. It is indigenous, free, clean, it reduces air pollution as well as poverty and provides energy security. Apart from that, offshore wind diversifies energy supply, hedges prices regarding their volatility of fossil fuels and is stronger and more constant than onshore wind.⁴ New and innovative offshore plants have two to three times the onshore capacity of a plant and are expected to produce an output of 5 MW in the future. During the last years, the installed offshore wind capacity has been doubled from 1.1 to 2.2 GW.⁵ The European Wind Energy Association estimates an offshore wind capacity of 10.000 MW in European territorial waters connecting to the grid at the end of this decade. Until 2020, they estimate 70.000 MW.⁶ The offshore wind industry is evolving into an independent industry. Nowadays it is more a kind of a niche market.⁷ But, the offshore technology is not without new challenges. Ultramodern wind energy plants have to bear the load of wind, waves and salt air under harsh weather conditions far away from the coast.⁸

In Europe, especially in Germany, new offshore wind projects are planned.⁹ The support of the government by acts is essential, especially in the development phase. The offshore wind industry needs systematic political support. Always and in course of time, not only in the development phase.¹⁰

¹ Hammer, Röhrig (2005), p. 6.

² cf. KPMG (2010), Preface, p. 21.

³ cf. Jarass, Obermair, Voigt (2009), p. 93.

⁴ cf. Global Wind Report (2011), p. 5, 7, 8 ; cf. Global Wind Report (2006), p. 55 ;
cf. Mostafaeipour (2010), p. 1722.

⁵ cf. KPMG (2010), Preface, p. 6, 10, 16.

⁶ cf. Hammer, Röhrig (2005), p. 11.

⁷ cf. KPMG (2010), Preface, p. 16.

⁸ cf. Hammer, Röhrig (2005), p. 6, 10.

⁹ cf. KPMG (2010), p. 11.

¹⁰ cf. KPMG (2010), Preface.

*"The attractiveness of renewable energy sources for private sector investors mainly hinges on the willingness of societies and government to promote renewable energy sources"*¹¹ Offshore wind power is a young industry and has not reached market competitiveness yet. It still faces economical, technical, and regulatory challenges. For overcoming these barriers, various governments implemented different types of subsidy or support schemes. The offshore remuneration plays a very important role and can be seen as a first guarantee of success.¹²

1.2 Objective and structure of the Master Thesis

Regarding Europe, investments in offshore wind rise rapidly. In emerging countries it receives hardly any attention, although a great potential exists. Building such an offshore plant and connect it to the grid is very expensive. Therefore, potential offshore plant operators have to be incentivized for example via an adequate offshore remuneration or other systematic political supports by the government.

The objective of the Master Thesis is to find out which offshore remuneration system is the best alternative for an implementation in Brazil. For answering that, different offshore remuneration systems will be analyzed, compared and evaluated. After that, it should be noted if the selected offshore remuneration system results in a profitable investment opportunity for a hypothetical offshore wind park scenario in Brazil. For this purpose, an economic potential analysis with a discounted cash flow model is employed. Based on this and on the knowledge of the previous analysis, comparison and evaluation, a recommendation for a suitable offshore remuneration system for Brazil is done.

The structure of the Master Thesis is the following: Chapter 2 starts with explaining the considered European countries. Apart from that, the table for comparing the different European offshore remuneration systems is presented. After that, a detailed description concerning the current offshore remuneration systems in the selected countries is done. The description deals with political frameworks, legal developments regarding the renewable energy in course of time and commonalities of the systems, for example. In order to obtain a better idea of the offshore remuneration systems worldwide, approaches of other countries are shortly described. Chapter 3 is concerned with the analysis, evaluation and comparison of the regarded offshore remuneration systems. Advantages and disadvantages of the systems were pointed out. This is followed by Chapter 4. Chapter 4 is related to the suitable offshore

¹¹ KPMG (2010), p. 21.

¹² cf. Prässler, Schächtele (2012), p. 3.

options were not considered, inspite of the fact that they might exist. This justifies itself by the fact that the regarded systems has to be different for an meaningful discussion.

In this case, advantages and disadvantages could be pointed out, the systems could be compared in a better way. Apart from that, excluded were country specific guidelines, lending rates, tax rates and affirmative action for emerging countries. Furthermore, the willingness of the Brazilian Government to learn from others²³¹ and aiming a prompt connection to the grid was assumed. Politically, the possibility of an unproblematic implementation of a Renewable Energies Act without implementation barriers might be doubtful in Brazil. The financial resources and the possibilities of the Brazilian Government for investments in renewable energies have not been worked out in detail. This might be important aspects.

6. Conclusion

The objective of this Master Thesis was to find a suitable offshore remuneration system for an implementation in Brazil. Therefore, the remuneration systems for different European countries were analyzed, evaluated and compared. Political frameworks, renewable acts, special features, changes in course of time, advantages and disadvantages of the different systems were pointed out. To give a recommendation for the best offshore remuneration system in Brazil, economical analysis for a fictional offshore wind park called AsaBranca were done. The analysis was done several times, and for each remuneration a new calculation with a new project value followed. The results of the project values were another important decision criterion. Based on this and on the further information of the previous chapters, a final discussion regarding the suitable offshore remuneration system for Brazil completed chapter 5.

It is rather unlikely that in the future the Brazilian offshore remuneration system is a mixture of the German, Danish and Netherlands approach. In reality, it is uncertain which system will prevail. The result of this work should be looked upon as an incentive for further research. Perhaps other, not considered factors may play an important role and might influence the choice for another offshore remuneration system. For Brazil, the implementation of a Renewable Energy Act as well as potential implementation barriers, affirmative action and the financial resources of the Brazilian Government for investments in renewable energies should be identified.

²³¹ f.e. taking the support of the "International Feed-in Cooperation"

To sum it up, Brazil sets themselves high targets in developing the offshore wind. In consideration of the right remuneration, as one important part, the emerging country will achieve the targets.