

Assiya Kenzhegaliyeva

# New Winds, New Rules: Standards in the German Offshore Wind Market and Their Influence on Norwegian Companies from the Foundations-Related Segment of the Value Chain

Master Thesis in MSc Globalization, Politics and Culture

Trondheim, May 2017

Supervisor: Asbjørn Karlsen

Norwegian University of Science and Technology

Faculty of Social and Educational Sciences

Department of Geography



Norwegian University of  
Science and Technology



## Abstract

Such global challenges as climate change require actions from the nation states, companies and consumers. Development of renewable energy is one of the solutions to the problem. Among different renewable energy sources offshore wind has a special place due to its stability and costs reduction potential. Germany as a pioneer in offshore wind created a framework that intends to help the further development of offshore wind energy in the country. As a maturing industry, though, German offshore wind could not be characterised by an established standards framework when the work on the first project was started. This paper investigates the standards that Norwegian companies from foundations-related segment of value chain had to deal with when they came to the German offshore wind market, whether set by institutions or by companies. It also tries to shed light on the development process of the standards and companies requirements and the implications they have on the case companies. The case companies perceive both national standards in Germany and clients requirements as different from what they are familiar with from offshore oil and gas sector. They experienced wider use of onshore practices in Germany compared to third countries. Acting as initiator and experts during standards development, German domestic companies could have significant influence on the shape of standards. Onshore practices used by the domestic companies could have been transferred into the new developing sector. Industrial history of the country can have an influence on the development of national standards. When establishing activities in a new market, standards framework and its background have to be taken into account.



## Preface

This master thesis is written within the InNOWiC (Internationalization of Norwegian Offshore Wind Capabilities) research project funded by the Research Council of Norway. The project focuses on 3 offshore wind markets, namely, UK, France and Germany with the goal of knowledge development related to potential opportunities and obstacles therein.<sup>1</sup>

Already starting this master programme I knew that I wanted to write my thesis on a topic related to renewable energy. Later, as a part of the master programme in “Globalization, Politics and Culture”, I completed an obligatory internship at SINTEF within the InNOWiC research project where I deepened my knowledge in this field. During the internship I was assigned different tasks that involved writing reports concerning local content requirement in the above-mentioned markets and coding stakeholders of offshore wind (OW) projects in different countries. This allowed me to use knowledge and language skills gained during the Master Programme in European and International Law in Germany in 2012-2013. While interested in the standards role in offshore wind, it was not clear in the beginning which aspects to consider. During the internship at SINTEF I had a possibility to attend different industry events and meet companies’ representatives. I got an opportunity to discuss the eventual topic both with the industry representatives and academia. After those discussions I decided to concentrate on the Norwegian companies and their experiences with standards when operating in German offshore wind.

I would like to thank my supervisor Asbjørn Karlsen for having provided so many interesting ideas and valuable comments and high-quality supervision, the informants whom I cannot name but can thank for their time and interesting insights, my classmates for our serious discussions and less serious conversations.

I would also like to thank my beloved husband for his enormous support and patience, proofreading and legal advising. Danke, dass du immer für mich da bist. Durch dich erinnere ich mich an die wirklich wichtigen Dinge im Leben!

---

<sup>1</sup> SINTEF (2016). Internationalization of Norwegian Offshore Wind Industry. Retrieved 14.03.2017 from <https://www.sintef.no/en/projects/internationalization-of-norwegian-offshore-wind-in/>



## Table of Contents

<b>Preface</b> .....	<b>v</b>
<b>List of abbreviations</b> .....	<b>ix</b>
<b>Introduction</b> .....	<b>1</b>
Context of the problem.....	1
Standards: contributing to the industry stability and shaping access to the value chain.....	2
Research questions .....	3
Structure of the paper.....	3
<b>Background</b> .....	<b>5</b>
OW in Germany.....	5
Standardization in OW .....	7
Standardization in OW in Germany .....	9
Norwegian companies in German offshore wind projects .....	11
Main background features .....	12
<b>Standards in Global Value Chain and Global Production Network frameworks</b> .....	<b>13</b>
Standards and standardization.....	13
Standards and competition .....	15
Global value chain concept.....	16
Global production network .....	19
Standards in Global Value Chains /Global Production Networks.....	21
GVC and GPN core concepts to be used.....	22
Delimitation of conceptual framework .....	23
<b>Methodology</b> .....	<b>25</b>
Case Study approach .....	25
Methods of data collection.....	26
Data analysis .....	29
Methodological basis of the paper - summary .....	30
<b>Research quality, limitations and ethical considerations</b> .....	<b>31</b>
Research quality and limitations .....	31
Ethical considerations .....	32
<b>Analysis of standards framework in German offshore wind projects and its implications for the case companies</b> .....	<b>35</b>
Standards framework in Alpha Ventus .....	35
Challenges experienced in German offshore wind by the case companies .....	41
National standards as a tool to develop own industry.....	43
Path dependence in standards development .....	44
BSH standards as a component of national industry strategy .....	46
Companies requirements as a governance strategy.....	47
Experiences of the case companies in German offshore wind .....	50
<b>Conclusion</b> .....	<b>51</b>
Main findings of the research .....	51
Research limitations.....	53
Suggestions for further research .....	53
Theoretical contribution of the paper .....	54
<b>References</b> .....	<b>57</b>





## List of abbreviations

AGOW	The Offshore Wind Energy Working Group, <i>Die Arbeitsgemeinschaft Offshore-Windenergie</i>
BSH	Federal Maritime and Hydrography Agency, <i>Bundesamt für Seeschifffahrt und Hydrographie</i>
CENELEC	European Electrotechnical Commission
DIN	German Institute for Standardization, <i>Deutsches Institut für Normung e.V.</i>
DNV	Det Norske Veritas
EEA	European Economic Area
EEG	Renewable Energy Sources Act, <i>Erneubare-Energien-Gesetz</i>
EEZ	Exclusive Economic Zone
EIA	Environmental Impact Assessment
EU	European Union
GL	Germanischer Lloyd
GPN	Global Production Network
GVC	Global Value Chain
IEA	International Energy Agency
IEC	International Electrotechnical Commission
InNOWiC	Internationalization of Norwegian Offshore Wind Capabilities
ISO	International Organization for Standardization
MW	Megawatt
NORWEP	Norwegian Energy Partners
OFW	Offshore Forum Wind Energy, <i>Offshore Forum Windenergie</i>
OW	Offshore Wind
SOW	Offshore Wind Foundation, <i>Stiftung Offshore Wind</i>
VDMA	Association of German Manufacturing Systems and Plant Construction and Engineering, <i>Verband Deutscher Maschinen- und Anlagenbau</i>
VSM	Association for Shipbuilding and Marine Engineering, <i>Verband für Schiffbau und Meerestechnik</i>
WAB	Wind Energy Agency, <i>Windenergie-Agentur</i>
WTO	World Trade Organization
WVW	Trade Association of Windpower Plants, <i>Wirtschaftsverband Windkraftwerke e.V.</i>



## Introduction

This chapter will provide information on the context of the problem chosen for this paper, the problem itself and research questions related thereto, theoretical framework and the structure of the paper.

### Context of the problem

There are many challenges faced by modern world today, and climate change is one of them.<sup>2</sup> Development of the renewable energy sources is one of many tools used by states and companies to tackle this challenge. Among other renewable energy sources offshore wind is expected to play an important role in the future European energy mix. Preconditions for that are that offshore wind has a potential for growth and simultaneous cost reduction. Additionally, it is considered as a stable source of renewable energy.<sup>3</sup> Being cheaper than “Nuclear Scenario”, offshore wind is also considered safer.<sup>4</sup> A number of jobs is predicted to be higher in offshore wind sector than in the alternative ones.<sup>5</sup> Preconditions to become a competitive energy source are complemented with a high export potential of the energy produced in offshore wind sector.<sup>6</sup> Although offshore wind is 10-15 years behind onshore wind, it is predicted that offshore wind can soon reach the same results.<sup>7</sup> In addition, offshore wind has a number of advantages compared to onshore wind. As mentioned before, offshore wind is a stable source of energy, also when compared to the onshore wind. Increased reliability in its turn can help to solve the grid connection problem which is especially important for Germany.<sup>8</sup>

Germany is one of the pioneers of the offshore wind industry.<sup>9</sup> In addition, Germany has a long history of onshore wind energy development. This would enable knowledge transfer from the onshore wind to the offshore.<sup>10</sup> The context for development of the

---

<sup>2</sup> United Nations Framework Convention on Climate Change (2014). The Paris Agreement. Retrieved 24.04.2017 from [http://unfccc.int/paris\\_agreement/items/9485.php](http://unfccc.int/paris_agreement/items/9485.php)

<sup>3</sup> Ernst&Young (2015). Offshore wind in Europe: Walking the tightrope to success. Retrieved from 24.04.2017 from <http://www.ewea.org/fileadmin/files/library/publications/reports/EY-Offshore-Wind-in-Europe.pdf>, p.3

<sup>4</sup> Ibid., p.3

<sup>5</sup> Ibid., p.3

<sup>6</sup> Ibid., pp.10-12

<sup>7</sup> Ibid., p.7

<sup>8</sup> Ibid., p.6

<sup>9</sup> Intpow&Innovation Norway (2011). Offshore Wind Germany. Market study 2011. Retrieved 24.04.2017 from [http://www.regionbergen.no/publish\\_files/intpow\\_pdf\\_germanoffshorewind\\_2.pdf](http://www.regionbergen.no/publish_files/intpow_pdf_germanoffshorewind_2.pdf), p.5

<sup>10</sup> Ernst&Young (2015). Offshore wind in Europe: Walking the tightrope to success. Retrieved from 24.04.2017 from <http://www.ewea.org/fileadmin/files/library/publications/reports/EY-Offshore-Wind-in-Europe.pdf>, p.6

renewable energy sources including offshore wind is formed by the Energy Concept (2010) and the Energy Package (2011) together with the Renewable Energy Sources Act (Erneubare-Energien-Gesetz, EEG). Being one of the world's largest markets, German offshore wind market is claimed to have attractive investment opportunities.<sup>11</sup> Lack of domestic market for offshore wind in Norway, but long years of experience in offshore oil and gas in combination with fluctuations in oil and gas prices make Norwegian companies consider opportunities in foreign markets.<sup>12</sup>

Offshore wind is characterised as unstable with higher financial risks (Steen&Hansen, 2013, p.2044), and a bigger role of political aspect than in oil and gas. While offshore wind along with other renewable energy sources is supported by subsidies<sup>13</sup>, profits in oil and gas are strongly influenced by market mechanisms, namely, oil and gas prices. Additionally, legal rules in offshore wind might change or differ from the ones companies are used to in other sectors, for example, in oil and gas (Steen&Hansen, 2013, p.2044). Having some sort of a benchmark would help companies to assess the opportunities and challenges in advance.

#### Standards: contributing to the industry stability and shaping access to the value chain

Lack of standards in emerging industries is typical, since standards are believed to accompany technical progress and maturing of the industry (Metcalf and Miles, 1994, p.250). Standards are seen as necessary to promote interoperability, increase quality (Xie et al., 2015, p.69) and contribute to the increase of international trade (Ponte&Gibbon, 2005, p.2). Standards can, therefore, be seen as the benchmark needed to secure the investments and increase predictability of the industry. At the same time, standards can exclude several actors from the value chain, whether set by private companies or public bodies (Nadvi, 2008, p.323; Menzel&Grillitsch, 2014, p.1). The theoretical part of this paper suggests to consider standards set by states as components of a state's regulatory power, namely, trade strategy measures and industry strategy measures (Dicken, 2011, p.182&p.185). This concept is suggested by the global production networks (GPN) approach. As to the standards set by companies, global value chain (GVC) approach considers them as a measure used by lead

---

<sup>11</sup> Germany Trade&Invest (2016). Wind Industry. A sustainable business in a stable investment environment. Retrieved 24.04.2017 from <http://www.gtai.de/GTAI/Navigation/EN/Invest/Industries/Energy/wind.html>

<sup>12</sup> Karlsen, A. (2016). Life after oil: Norwegian offshore wind capabilities. Retrieved 24.04.2017 from <https://blogg.svt.ntnu.no/life-after-oil-norwegian-offshore-wind-capabilities/>

<sup>13</sup> Ernst&Young (2015). Offshore wind in Europe: Walking the tightrope to success. Retrieved 24.04.2017 from <http://www.ewea.org/fileadmin/files/library/publications/reports/EY-Offshore-Wind-in-Europe.pdf>, p.10

companies to exercise their will over the other actors of value chain (Ponte and Gibbon, 2005, p.1).

## Research questions

With regard to these background and theory it seems interesting to consider standards-related experiences of Norwegian companies that operated in German offshore wind market. Additionally, it seems logical to consider the development of these standards. Therefore, the research questions of this paper could be formulated as following: *what standards Norwegian companies from foundations-related segment of value chain have to deal with when operating in German offshore wind market, how these standards are developed and how they influence activities of Norwegian companies establishing their activities in Germany.* Three companies were chosen as case companies for this paper. Namely, OWEC Tower, Aker Verdal (today Kværner Verdal) and NorWind. These companies participated in the Alpha Ventus project.<sup>14</sup> The construction phase of this project started on the 25<sup>th</sup> of June, 2008 with full commission of the farm on the 27<sup>th</sup> of April, 2010.<sup>15</sup> Aker Verdal was also active in Nordsee Ost.<sup>16</sup> The construction phase of Nordsee Ost started on 30<sup>th</sup> of July, 2012, while the farm was fully commissioned on the 11<sup>th</sup> of May, 2015.<sup>17</sup> Both these projects are regarded as German due to the location in German waters.

## Structure of the paper

Structure of the paper is as following: starting with the introduction, this paper moves to the background chapter. The background chapter includes factual information on the offshore wind development in Germany, standardization in offshore wind in general and in Germany in particular. It also mentions which Norwegian companies participated in the development of offshore wind farms in Germany. The theory chapter following afterwards explains such terms as “standard” and “standardisation” and standards’ influence on competition. Providing explanation of GVC and GPN frameworks, this chapter focuses on the standards’ place in them. Afterwards the methodology chapter follows, providing information concerning such choices as research design, cases choice, data collection methods, selection

---

<sup>14</sup> 4C Offshore (2017). Organizations working on Alpha Ventus. Retrieved 16.03.2017 from <http://www.4coffshore.com/windfarms/contracts-on-alpha-ventus-de01.html>

<sup>15</sup> 4C Offshore (2017). Events on Alpha Ventus. Retrieved 14.03.2017 from <http://www.4coffshore.com/windfarms/project-dates-for-alpha-ventus-de01.html>

<sup>16</sup> 4C Offshore (2017). Organizations working on Nordsee Ost. Retrieved 17.03.2017 from <http://www.4coffshore.com/windfarms/contracts-on-nordsee-ost-de06.html>

<sup>17</sup> 4C Offshore (2017). Events on Nordsee Ost. Retrieved 17.03.2017 from <http://www.4coffshore.com/windfarms/project-dates-for-nordsee-ost-de06.html>

of informants. It also describes some efforts made to increase the quality of this research and mentions limitations and ethical considerations of this paper. The analysis chapter connects the data collected through the use of various methods (participatory observation, documents review and interview) with the theory. It tries to identify which standards Norwegian companies had to deal with, how these standards were developed and what role they played for the case companies. The conclusion chapter summarizes the findings and contributions of the paper and elaborates on the potential aspects for future research.

## Background

### OW in Germany

Current framework for renewable energy development in Germany is mostly shaped by the Energy Concept 2010. This concept defines energy targets that are supposed to cover increasing demand and at the same time contribute to the climate protection. Renewable energy is supposed to serve as a cornerstone in this process.<sup>18</sup> Policies based on this concept were to certain extent reshaped by the Energy Package 2011. After the Fukushima accident an immediate 3-months nuclear moratorium was imposed<sup>19</sup>. Later, in June 2011, the German Parliament decided on nuclear phase-out by 2022.<sup>20</sup> This process ended with an adoption of the 13<sup>th</sup> law “On changes to the Nuclear Law” in July 2011.

Development of renewable energy sources in Germany was actively supported by the means of the German Renewable Energy Sources Act (EEG). Originally, the EEG regulated access to subsidies in form of feed-in tariff for the renewable energy producers. The latest changes adopted in 2016 mark a turn to more market-regulated tools.<sup>21</sup> The main changes concern the conditions of getting this aid: instead of being determined by state, compensation will be defined by the tendering process.<sup>22</sup> The policy support is considered to be one of the most important reasons for the development of German renewable energies (Wüstenhagen&Bilharz, 2006).

---

<sup>18</sup> Federal Ministry of Economics and Technology; Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (2010). Energy Concept for environmentally sound, reliable and affordable energy supply. Retrieved 14.03.2017 from <http://www.bmwi.de/English/Redaktion/Pdf/energy-concept,property=pdf,bereich=bmwi,sprache=en,rwb=true.pdf>, pp.5&11.

<sup>19</sup> Die Bundeskanzlerin Merkel (2011). Pressestatements von Bundeskanzlerin Angela Merkel und Bundesaußenminister Guido Westerwelle zu den Folgen der Naturkatastrophen in Japan sowie den Auswirkungen auf die deutschen Kernkraftwerke. Retrieved 15.03.2017 from <https://www.bundeskanzlerin.de/ContentArchiv/DE/Archiv17/Mitschrift/Pressekonferenzen/2011/03/2011-03-14-bkin-lage-japan-atomkraftwerke.html>

<sup>20</sup> Siemens (2012). One year after Fukushima – Germany’s path to a new energy policy. Retrieved 15.03.2017 from <http://www.siemens.com/press/pool/de/feature/2012/corporate/2012-03-energiewende/factsheet-e.pdf>

<sup>21</sup> WindEurope (2016). Germany EEG reform a mixed bag for wind energy. Retrieved 15.03.2017 from <https://windeurope.org/newsroom/press-releases/germany-eeg-reform-a-mixed-bag-for-wind-energy/>

<sup>22</sup> Presse- und Informationsamt der Bundesregierung (2016). Förderung steuern, Kosten senken. Retrieved 14.03.2017 from <https://www.bundesregierung.de/Content/DE/Artikel/2016/06/2016-06-08-eeg-novelle.html>

Germany today is on the second place in the world accounted for the installed offshore wind capacity – 27% (after UK with 40%).<sup>23</sup> The first significant changes in German energy mix caused by the increase share of the offshore wind occurred in 2010.<sup>24</sup>

Installation of offshore wind capacity in Germany started with smaller projects such as Ems Emden<sup>25</sup>, Breitling<sup>26</sup> and Hooksiel<sup>27</sup> (2004, 2006 and 2008 respectively) and continued with its first bigger pilot project Alpha Ventus. The construction started in 2008, and the commissioning took place in 2010. Installed capacity was equal to 60 MW (Megawatt).<sup>28</sup>

The following years demonstrated stable growth in German offshore wind (see table 1). In 2016 the installed capacity increased, but the share of the new installed capacity was significantly lower than in the previous year. Among the reasons for this difference the experts name catch-up effects in 2015.<sup>29</sup> Amendments to the EEG are also believed to have caused the slow-down.<sup>30</sup>

Overall, with currently installed capacity of 4108MW, it is expected that offshore wind installations by 2030 will account for 15GW of the German energy mix.<sup>31</sup> No exact data on percentage has been found. This might be explained by the fact that energy demand in Germany is expected to fall. At the same time, the experts consider as possible that offshore wind could have a leading role in future energy mix.<sup>32</sup>

---

<sup>23</sup> Global Wind Energy Council (2016). The Global Wind Energy Outlook 2016. Retrieved 14.03.2017 from <http://files.gwec.net/files/GlobalWindEnergyOutlook2016>, p.13

<sup>24</sup> Fraunhofer Institute for Wind Energy and System Technology IWES (2015). Wind Energy Report Germany 2014. Retrieved 14.03.2017 from [http://publica.fraunhofer.de/eprints/urn\\_nbn\\_de\\_0011-n-354656-16.pdf](http://publica.fraunhofer.de/eprints/urn_nbn_de_0011-n-354656-16.pdf), p.9

<sup>25</sup> Lorc Knowledge (2011). EMS Emden Offshore Windfarm. Retrieved 14.03.2017 from <http://www.lorc.dk/offshore-wind-farms-map/ems-emden?free=ems>

<sup>26</sup> 4C Offshore (2016). Events on Breitling. Retrieved 14.03.2017 from <http://www.4c offshore.com/windfarms/project-dates-for-breitling-de42.html>

<sup>27</sup> 4C Offshore (2016). Events on Hooksiel. Retrieved 14.03.2017 from <http://www.4c offshore.com/windfarms/project-dates-for-hooksiel-de76.html>

<sup>28</sup> 4C Offshore (2016). Events on Alpha Ventus. Retrieved 14.03.2017 from <http://www.4c offshore.com/windfarms/project-dates-for-alpha-ventus-de01.html>

<sup>29</sup> Clean Energy Wire (2016). Offshore Wind Energy Development in Germany in 2016. retrieved 14.03.2017 from <https://www.cleanenergywire.org/news/kickstarting-energiwende-transport-sector-offshore-wind-statistics/offshore-wind-energy-development-germany-2016>

<sup>30</sup> Global Wind Energy Council (2016). Expansion of offshore wind energy in Germany in the first half of 2016. Retrieved 14.03.2017 from <http://www.gwec.net/expansion-of-offshore-wind-energy-in-germany-in-the-first-half-of-2016/>

<sup>31</sup> Stiftung Offshore-Windenergie (2017). Sauberer Strom vom Meer. Retrieved 14.03.2017 from <http://www.offshore-stiftung.de/offshore-windenergie>

<sup>32</sup> Fraunhofer Institute for Wind Energy and System Technology IWES (n.d.). The importance of wind energy in the energy sector and for the German Energiwende. Retrieved 14.03.2017 from [http://www.offshore-stiftung.de/sites/offshorelink.de/files/documents/SOW\\_Download\\_FraunhoferIWES\\_OffshoreStudy\\_ExecutiveSummary.pdf](http://www.offshore-stiftung.de/sites/offshorelink.de/files/documents/SOW_Download_FraunhoferIWES_OffshoreStudy_ExecutiveSummary.pdf), p.3



**Table 1. German Offshore Wind Development**

	2011	2012 <sup>33</sup>	2013	2014 <sup>34</sup>	2015 <sup>35</sup>	2016 <sup>36</sup>
Installed capacity, cumulated (MW)	200	280	521	1044	3294	4108
New installed capacity (MW)	128	80	240	523	2282	818
Number of turbines	52	68	116	257	792	948
Added turbines	37	16	48	141	546	156

### Standardization in OW

The first standards and codes within wind energy field were developed around 1980s first at the national level. This development process started with the USA, Canada, Germany, Denmark, Sweden and the Netherlands. Their efforts initiated correspondent initiatives at the international and European levels. The main actors here were the International Electrotechnical Commission, also known as IEC, (since 1987) and the European Electrotechnical Commission (CENELEC). These organizations dealt with the development of technical standards and reports related to design and tests of various offshore and onshore applications (Andreä et al., 2009, p.225). The International Energy Agency (IEA) has also contributed to this process through the development of recommended practices. Although

<sup>33</sup> Fraunhofer Institute for Wind Energy and System Technology IWES (2013). Windenergie Report Deutschland 2012. Retrieved 14.03.2017 from [http://publica.fraunhofer.de/eprints/urn\\_nbn\\_de\\_0011-n-2385784.pdf](http://publica.fraunhofer.de/eprints/urn_nbn_de_0011-n-2385784.pdf), p.7

<sup>34</sup> Fraunhofer Institute for Wind Energy and System Technology IWES (2015). Wind Energy Report Germany 2014. Retrieved 14.03.2017 from [http://publica.fraunhofer.de/eprints/urn\\_nbn\\_de\\_0011-n-354656-16.pdf](http://publica.fraunhofer.de/eprints/urn_nbn_de_0011-n-354656-16.pdf), p.7

<sup>35</sup> German Wind Energy Association (2016). Offshore wind energy in Germany: Figures 2015 – Record achieved due to catch-up effect. Retrieved 14.03.2017 from <https://www.windenergie.de/en/press/press-releases/2016/offshore-wind-energy-germany-figures-2015-record-achieved-due-catch>

<sup>36</sup> Stiftung Offshore Windenergie (2017). Offshore-Windenergie: Ausbau schreitet nun kontinuierlich voran – Bundesregierung bremst weitere Dynamik. Retrieved 15.03.2017 from <http://www.offshore-stiftung.de/offshore-windenergie-ausbau-schreitet-nun-kontinuierlich-voran-%E2%80%93-bundesregierung-bremst-weitere>

some of them were later replaced by the ones from other organizations, for example, IEC, several are still valid.<sup>37</sup>

The first regulations for offshore wind turbines came in 1995. Developed by Germanischer Lloyd (GL) and Garrad Hassan, they intended to include the company’s expertise in both wind and oil and gas. In 2001 the Danish Energy Agency issued the “Recommendation for technical approval of offshore wind turbines” and Det Norske Veritas (DNV) contributed to the offshore wind standardization by its OSJ101 “Design of offshore wind turbine structures” in 2004 (Andreä et al., 2009, p.225).

There are several challenges for the development of the international (global) standards. It is claimed that universality is very difficult to achieve, especially, within the wind industry, where performance might depend on weather conditions. Another difficulty arises from the complexity of the offshore wind farm applications. Standard development requires simplification that is considered to influence the quality extent. It is also difficult to ensure that the standard will be accepted and thereafter followed by a big number of countries.<sup>38</sup>

Another challenge relates to the scope of the standards. Andreä et al. (2009) name several standards applicable for the wind turbines. They compare the scope of such guidelines and standards as IEC 61400-3 Design Requirements (2009), GL Guideline including design requirements and certification procedure (1995, revised in 2005), Danish Regulations for technical approval of offshore wind turbines (2001), DNV-OS-J101 for the design of offshore wind turbine structures (2004) and come to a conclusion that each of them covers different aspects with some intersections.

**Table 2. Comparison of scope of standards/guidelines in the field of offshore wind energy<sup>39</sup>**

	Project certification	Loads	Support Structure	Machinery	Safety and Electrics
IEC 61400-3		V	(V)		(V)
GL Guideline	V	V	V	V	V
Danish		V	V		(V)

<sup>37</sup> Wind Power Monthly (2012). The ongoing effort to globalise standards. Retrieved 15.03.2017 from <http://www.windpowermonthly.com/article/1114328/ongoing-effort-globalise-standards>

<sup>38</sup> Ibid.

<sup>39</sup> Andreä et al (2009). Standards and Certification. P.227

Regulations					
DNV-OS-J101	V	V	V		

*V – subject is dealt with; (V) – subject is partly dealt with or reference to other standard*

### Standardization in OW in Germany

The German Standardization Strategy (2010)<sup>40</sup> intends to ensure achievement of the following goals: 1) securing Germany’s position as a leading industrial nation; 2) supporting successful society and economy; 3) ensuring deregulation; 4) promoting technological convergence; 5) providing efficient procedures and tools.<sup>41</sup> It is sometimes, nevertheless, claimed that due to bureaucracy and regulations complexity entering the German market can be challenging, even if the standards are usually not intended to discriminate the foreign companies.<sup>42</sup> Germany has been one of the pioneers and is still one of leading countries within standardization and certification (Woebekking, 2008, p.1).

Standardization in the wind energy sector in Germany dates back to 1979 and is associated with the first expert’s opinion published by the Germanischer Lloyd. The opinion related to the reliability of operation, functionality and capacity for a wind turbine in Germany (Adrian, 2014, p.12). Afterwards the Ministry of the Interior of Schleswig-Holstein published the first formal guidelines. These guidelines provided information on the design, installation and operation of wind power plants and with several amendments remained dominant until the replacement by the federal ones (Adrian, 2014, pp.12-13).

Standards are used for the licensing procedure, and in this regard it is necessary to mention that different authorities depending on the location of the project, onshore or offshore, license German wind projects. Involvement of different authorities also relates to the different parts of the offshore wind projects (Prall, 2009, pp.15-16).

The part of the offshore wind farm situated within the German Exclusive Economic Zone (EEZ) falls under the responsibility of the Federal Maritime and Hydrography Agency

<sup>40</sup> The original strategy came in 2004, meanwhile the one used for this paper came later as an update

<sup>41</sup> DIN German Institute for Standardization (2013). The German Standardization Strategy: an update. Retrieved 20.03.2017 from

[http://www.iso.org/sites/PEG/docs/PEG%20Documents/08\\_DNS\\_2010e\\_akt.pdf](http://www.iso.org/sites/PEG/docs/PEG%20Documents/08_DNS_2010e_akt.pdf), p. 3

<sup>42</sup> Export.gov. (2016) Market Research on Germany: Country Commercial Guide. Trade Regulations, Customs and Standards. Retrieved 21.03.2017 from

<http://2016.export.gov/germany/marketresearchongermany/countrycommercialguide/traderegulationsandstandards/index.asp>

(BSH),<sup>43</sup> meanwhile licensing of cables lying within the 12 nautical miles zone and cables going from the coast to the onshore transformer station is performed by the local authorities of the respective federal coastal states, *Bundesländer*.<sup>44</sup> Since it would be time-consuming to analyse the documents and standards relevant for the latter category, it seems more logical to include the standards used for the licensing of the EEZ parts of the wind farms.

In accordance with the Marine Facilities Ordinance, the BSH has to check whether the foreseen installation- and operation-related activities would create any threats to the marine environment, safety and efficiency of shipping traffic, national or allied defence. If none of these threats are present, the plan might be approved. There might also be additional requirements resulting from public law.<sup>45</sup>

There are 3 phases of the plan approval procedure following the submission of the application. First, it has to be checked whether all the necessary documents were submitted. The applicants are given an opportunity to complete their applications in case some of the documents are missing. During this stage competent authorities can comment on the applications. In the second round, other stakeholders can get involved. In the end of this stage applicants usually present their projects at the conference where different stakeholders are present.<sup>46</sup>

Depending on the characteristics of the wind turbines, additional requirements might have to be fulfilled. Here Environmental Impact Assessment (EIA) can be named as an example.<sup>47</sup> Having received a complete application, the BSH asks competent authorities to comment thereon. These comments construe the base for a new discussion round.<sup>48</sup> The final decision is made by the BSH in case 1) it finds that all the necessary requirements were met; 2) the Waterways and Shipping Directorate General grant consent concerning safety and efficiency of navigation.<sup>49</sup>

---

<sup>43</sup> Bundesamt für Seeschifffahrt und Hydrographie (2016). Plan approval procedure for the construction and operation of installations in the EEZ. Retrieved 20.03.2017 from

[http://www.bsh.de/en/Marine\\_uses/Industry/Wind\\_farms/Approval\\_Procedure.jsp](http://www.bsh.de/en/Marine_uses/Industry/Wind_farms/Approval_Procedure.jsp)

<sup>44</sup> Prall, U. (2009). Legal frame for the use of offshore wind energy in Germany. Retrieved 20.03.2017 from [http://www.balticseaportal.net/media/upload/File/Event.materials/Legal\\_frame\\_offshore\\_wind/Background\\_paper\\_Prall.pdf](http://www.balticseaportal.net/media/upload/File/Event.materials/Legal_frame_offshore_wind/Background_paper_Prall.pdf), p.12

<sup>45</sup> Bundesamt für Seeschifffahrt und Hydrographie (2016). Plan approval procedure for the construction and operation of installations in the EEZ. Retrieved 20.03.2017 from

[http://www.bsh.de/en/Marine\\_uses/Industry/Wind\\_farms/Approval\\_Procedure.jsp](http://www.bsh.de/en/Marine_uses/Industry/Wind_farms/Approval_Procedure.jsp)

<sup>46</sup> Ibid.

<sup>47</sup> Ibid.

<sup>48</sup> Ibid.

<sup>49</sup> Ibid.

BSH issued several standards that are used for the approval or plan approval decisions. Standard “Investigation of the Impacts of Offshore Wind Turbines on the Marine Environment (StUK3)” (2007) provides information on the minimum requirements for marine environmental surveys.<sup>50</sup> Standard “Design of Offshore Wind Turbines” (2007, updated in 2015) regulates the following components of the offshore wind farm: turbine, support structure, cabling within the farm, transformer substation including platform, power export systems from transformer substation and grid connection on land.<sup>51</sup> Standard Ground Investigations (2003, updated in 2008 and 2014) sets minimum requirements related to investigations into offshore wind energy structures, offshore stations and power cables and geotechnical surveys.<sup>52</sup>

### Norwegian companies in German offshore wind projects

In 2016 Bente Nyland (Director General of the Norwegian Petroleum Directorate) admitted that Norwegian oil industry was facing crisis.<sup>53</sup> Already prior to the oil crisis, some Norwegian companies tried to apply their oil and gas and maritime experiences in other sectors. For example, starting from the first big offshore wind project, Alpha Ventus, Norwegian companies were present in the German offshore wind market. While some companies were replaced by new actors within the respective value chain segments, some others, for example, StormGeo AS, Statnett Transport, Olympic Shipping AS have participated in several projects. Overall, Norwegian companies engage mostly in installation activities directly or by supplying their vessels to other companies, also non-Norwegian. Installation activities in German offshore wind projects performed by Norwegian companies relate mostly to cables installation. Here such companies as Siem Offshore AS, Statnett Transport AS, Volstad Maritime AS can be mentioned. Fred Olsen Windcarrier was active in several German projects and participated in towers and nacelles installation.<sup>54</sup> Some of the Norwegian companies have also contributed to the development of offshore wind sector in

---

<sup>50</sup> Bundesamt für Seeschifffahrt und Hydrographie (2007). Standard Investigation of the Impacts of Offshore Wind Turbines on the Marine Environment (StUK3), p.5. Retrieved 21.03.2017 from [http://www.bsh.de/en/Products/Books/Other\\_publications/Stuk-eng.pdf](http://www.bsh.de/en/Products/Books/Other_publications/Stuk-eng.pdf)

<sup>51</sup> Bundesamt für Seeschifffahrt und Hydrographie (2007). Standard Design of Offshore Wind Turbines, p.5. Retrieved 21.03.2017 from <http://www.bsh.de/en/Products/Books/Standard/7005eng.pdf>

<sup>52</sup> Bundesamt für Seeschifffahrt und Hydrographie (2014). Standard Ground Investigations, p.5. Retrieved 21.03.2017 from <http://www.bsh.de/en/Products/Books/Standard/7004eng.pdf>

<sup>53</sup> Mohsin&Holter (2016). Norway declares crisis in oil industry as devaluation continues. Retrieved 22.03.2017 from <https://www.bloomberg.com/news/articles/2016-01-14/norway-government-rules-out-extra-stimulus-as-oil-rout-persists>

<sup>54</sup> Fred.Olsen Windcarrier (2017). Track Record. Retrieved 22.03.2017 from <http://windcarrier.com/track-record/#project-map>

Germany by supplying necessary components. Several examples here would be Parker Scanrope AS, ABB AS, Norwind, Aker Verdal (nowadays Kvaerner Verdal) etc.<sup>55</sup>

### Main background features

This chapter has described the German offshore wind market as second largest in the world nowadays. The growth of installed capacity that happened there within the last years is remarkable, although there is a big discussion concerning the reasons of such success. Global OW is characterised by the existence of a large number of standards that differ in scope. One of the challenges met by the global OW standards and reasons for the development of national standards by the respective authorities is difficulty to make them universal and at the same time preserve higher quality insurance. The German Federal Maritime and Hydrographic Agency of Germany (BSH) uses several standards for the assessment whether the project plan approval can be granted.

Norwegian companies have participated in several German offshore wind projects, starting with Alpha Ventus. The companies were involved both in components design and manufacturing, as well as installation activities. The latter category is mostly presented by cable-laying. There are three companies that were engaged in foundations production within Alpha Ventus project: OWEC Tower, Kvaerner Verdal and NorWind. These companies and their experiences during Alpha Ventus project will form the basis for the data collection and analysis parts of this paper. Kvaerner's experience in the Nordsee Ost will also be taken into consideration.

---

<sup>55</sup> See Annex I for the full overview

## Standards in Global Value Chain and Global Production Network frameworks

This chapter starts with an overview of standards and standardization, followed by a description of the effects that standards can have on competition. The subsequent part of this chapter concerns two related, but different concepts with the focus on those elements that seem more relevant for this paper. Afterwards a short overview on standards' place in both concepts follows. After summing up the main components of both concepts that will be used for the analysis later, the summary of the chapter follows.

### Standards and standardization

Standardization is the process of developing, ratifying and implementing standards (Gao et al., 2013, p.201). It is also defined as a process of developing and implementing specifications based on the consensus of the views of firms, users, interest groups and governments (Xie et al., 2015, p.69), meanwhile standard is defined as a set of technical characteristics/specifications that a producer adheres to (David&Greenstein, 1990, p.4). Standards are supposed to be a tool to increase compatibility, interoperability and quality (Xie et al., 2015, p.69). Quality standards are believed to contribute to the development of economies of scale and market creation (Ponte&Gibbon, 2005, p.2). It is believed that standards evolution happens in parallel to the industry development (Menzel&Grillitsch, 2014, p.5).

National standards are seen as an instrument to increase competitiveness of the national economies. At the same time, international standards play a significant role for the liberalization of international trade (Blind&Mangelsdorf, 2016, p.13).

Standards can also be developed by companies that have dominant positions in a market or by standardization bodies (Xie et al., 2015, p.69). Companies can join standardization alliances through participation in standard developing bodies (Blind&Mangelsdorf, 2016, p.13). The motives for the companies might differ. Among them risk sharing, knowledge acquisition, getting access to market and compliance with governmental policies are mentioned (Ibid., pp.15-16). Such standardization bodies are widely recognised by the governments in Europe (Ibid, p.14). States sometimes mandate development of necessary standards to the recognised standardization bodies. Cooperation between state and companies is also possible and might occur within standardization bodies (Ibid.). Sometimes industry encourages development of standard by the governmental institutions (Menzel&Grillitsch, 2014, p.6). Companies are encouraged to participate in

standards development, since it gives them access to the latest knowledge about technological innovations and allows them to shape the standards.<sup>56</sup>

Overall, there are *different types of standards*, depending on the target of standardization or the body developing the standard. A standard can be developed to communicate the information about the product (whether about the quality and architecture) or the process (how a certain product is produced). When it comes to the quality, the standards are usually developed for the quality control of more complex products, since it is argued that the quality of the simple products is reflected by their price (Menzel&Grillitsch, 2014, p.3).

As to the typology based on the standard development process, David and Greenstein (1990) mention 2 main forms with a number of sub-categories. The first main form – market-mediated standards – includes a) ”unsponsored” standards – the standards that emerged and were accepted despite the absence of a particular ”author” with its own specific interests; and b) ”sponsored” standards influenced by one or several stakeholders with their interests reflected in the standards. This group of the standards is also known as de-facto standards (P.4).

The second main form identified by David and Greenstein includes the standards formed by a concrete standardization body, whether national or international, private or state. This group includes c) standards formed by voluntary standardization bodies and d) standards resulting from governmental action, sometimes having a form of binding law. This group is known as de-jure standards (Menzel&Grillitsch, 2014; David&Greenstein, 1990, p.4). These standards can be imposed by the institutions and therefore determine consequent developments of the products, industries etc. (Utterback, 1996, p.28).

As it was mentioned before, different actors, for example, private and public, can cooperate when developing new standards. Additionally, national standards can become a basis for the international ones (Adrian, 2014, p.6&14). This is especially applicable for the wind turbine industry with its first standards developed by Danish and British national institutions (Adrian, 2014, p.1). At the same time, state institutions developing new standards might opt for adapting the international ones. As an example here German BSH standards can be mentioned. The BSH standards are based on Eurocodes<sup>57</sup> with several practices drawn

---

<sup>56</sup> CENELEC (2013). Standards and your business. How your business can benefit from standards and participate in standardization activities. Retrieved 24.04.2017 from [https://www.cencenelec.eu/News/Publications/Publications/Standards-and-your-business\\_2013-09.pdf](https://www.cencenelec.eu/News/Publications/Publications/Standards-and-your-business_2013-09.pdf)

<sup>57</sup> Reference design codes intended to promote harmonization of the internal market for construction products and engineering services



from international documents developed by, for example, DNV.<sup>58</sup> In the latter case, international standard may be based on a national one from a third country or can be developed by international standard setting organisations (Adrian, 2014, p.6).

It is important to keep in mind that existing standards do not exclude the possibility for change or development of new ones. Menzel and Grillitsch (2014, p.6) provide several examples that might cause these processes: limited scope of the existing standard, rise of new important aspects or product qualities that need codification etc.

### Standards and competition

Although the standards are usually set to promote quality and compatibility and therefore can enhance trade, they can also have a reverse effect on trade. In this case foreign companies are in disadvantaged position due to the artificially strict technical requirements imposed by the government of the country of operation/potential establishment (Wilson, 2012, p.2).

There are several international and regional measures intended to ensure that standards do not distort competition by creating unjustified obstacles to trade. The Agreement on Technical Barriers to Trade (World Trade Organization, WTO) is supposed to "ensure that technical regulations and standards, including packaging, marking and labelling requirements, and procedures for assessment of conformity with technical regulations and standards do not create unnecessary obstacles to international trade" on the global level.<sup>59</sup>

Nevertheless, some exceptions are possible if the measure was adopted to fulfil a legitimate goal. Namely, if they are intended to protect national security, safety or human health, animal or plant life or health, environment or to prevent deceptive practices.<sup>60</sup> With the dissolution of the reason for such measure, the measure should not be maintained any longer.<sup>61</sup> The WTO Members are encouraged to participate in the preparation of the standards for the products for which they (the Members) have developed own regulations.<sup>62</sup> Performance should play a decisive role where possible when developing the standard.<sup>63</sup>

EU Directive 2015/1535 of the European Parliament and of the Council of 9.09.2015 lays down a procedure for the provision of information in the field of technical regulations and of rules on Information Society services and intends to ensure fair competition

---

<sup>58</sup>M. Zeiler on behalf of N.Nolte (written communication, 14.03.2017)

<sup>59</sup> WTO, Agreement on Technical Barriers to Trade, 1994, preamble

<sup>60</sup> WTO, Agreement on Technical Barriers to Trade, 1994, 2.2

<sup>61</sup> WTO, Agreement on Technical Barriers to Trade, 1994, 2.3

<sup>62</sup> WTO, Agreement on Technical Barriers to Trade, 1994, 2.6

<sup>63</sup> WTO, Agreement on Technical Barriers to Trade, 1994, 2.8

undistorted by barriers resulting from technical specifications. The measures, including development of technical specification that might restrict trade within the internal market, are prohibited. Every Member State must notify the Commission on the development of technical regulations. Nevertheless, under some conditions use of certain products might be limited by the national technical regulations.<sup>64</sup> These include such grounds as need for protection of public health or protection of consumers or the environment. In this case, the Member States shall provide explanatory basis and necessary evidence.<sup>65</sup>

As to private standards set by companies, there are applicable antitrust regulations both at regional (EU) and national level.<sup>66</sup>

### Global value chain concept

The global value chain (GVC) concept is one of the efforts to explain organisation and scope of economic activities in the modern world (Gereffi et al., 2001, p.1). The central term of the concept – “value chain” – relates to “the full range of activities that firms and workers perform to bring a product from its conception to end use and beyond. This includes activities such as design, production, marketing, distribution and support to the final consumer. The activities that comprise a value chain can be contained within a single firm or divided among different firms” (Gereffi&Fernandez-Stark, 2011, p.4).

In the 2000s the number of articles and books devoted to the global value chains was clearly growing. The researchers developing this framework also tried to make it universally applicable (Lee, 2010, p.2992). Nevertheless, the number of interrelated and overlapping terms was growing as well. It was considered as one of the global value chain analysis challenges. The clarification of the types of chains was, therefore, named among the goals and subsequently the outcomes of the Bellagio conference in 2000. As the result, it was confirmed that focus points of supply chains, global commodity chains, global filliere approach, and global value chains concepts differed. But overall, despite the recognition of the different emphases of the above-mentioned concepts, it was agreed to use “value chain” concept over the other alternatives (Gereffi et al, 2001, pp.2-3). Global value chain concept was criticised for focusing on the sequence of operations, not taking into account power relations and interaction with other actors that might influence the production process (Henderson et al., 2002).

---

<sup>64</sup> The European Parliament and the Council, EU Directive 2015/1535, 2015, preamble

<sup>65</sup> The European Parliament and the Council, EU Directive 2015/1535, 2015, Art.5, para.1

<sup>66</sup> For example, TFEU art. 101, Norwegian Competition Act article 10

Nevertheless, current GVCs approach suggests inclusion of 4 main dimensions for the analysis: input-output structure, geographic scope, governance and institutional context (Gereffi&Fernandez-Stark, 2011) and, therefore, fills in the most of the gaps that were criticised by GPN approach. Current version of GVC concept, therefore, approaches the GPN framework. Two of these 4 main dimensions – governance and institutional context – seem relevant for the scope of this paper.

*The concept of governance* is one of the significant research areas due to the need to understand which actors/companies have influence within the value chains concerning the resources, types of products and methods of production (Lee, 2010, p.2993). The main distinction was initially made between *producer- and buyer-driven chains* (Ibid.).

Producer-driven commodity chains referred to the industries where particular actors (usually transnational or other large manufacturing companies) controlled the production systems. Buyer-driven commodity chains were characterised by the central role of large companies in establishing decentralised production networks in several countries (Gereffi, 1994, p.97). Examples for such companies can be large retailers, as well as highly successful branded merchandisers and agro-food processors (Ponte & Sturgeon, 2014, p.201). This typology (producer-driven and buyer-driven chains) is criticised for not reflecting the complexity of chain governance (Lee, 2010, p.2993). Several authors (Gibbon, 2008, Fold, 2002) develop alternative governance forms. They drew attention to such factors as cultural aspects, role of international trade, use of competition as governance strategy, etc.

Later the more elaborated *typology consisting of 5 governance structures* complemented the global value chains analysis: markets, modular, relational, captive and hierarchy. Lead firms have more influence on their partners. Defining product and market, they exercise control and coordination within the GPNs (Yeung&Coe, 2015, pp.44-45). Market governance is associated with relatively simple transactions, easy information transmission, little or almost no formal cooperation between buyers and suppliers and therefore possibilities for easy switch to new partners. Price is the main governance mechanism in such chains (Gereffi&Fernandez-Stark, 2011, p.9). Modular governance relates to more complex transactions and buyer-supplier interactions, but the information is still easy to codify. This codified information in form of standards set by lead firms is considered as elements of governance and communicate information about quality of the product (Ponte&Gibbon, 2005, p.2). Although relationships matter more in such chains, the switching costs are still low, since suppliers usually are fully responsible for process technology, they adjust their products in accordance with the customer's requirements-lead firms' standards.

These requirements usually present big volumes of information that suppliers have to deal with. Relational governance involves complex information exchange and knowledge sharing and therefore requires mutual trust. Time required to find an appropriate partner increases, and so do the costs related thereto (Gereffi&Fernandez-Stark, 2011, p.9). Captive chains are distinguished by a higher degree of influence by the lead firm, since the number of buyers is usually low. When information on product specifications cannot be easily transmitted and codified or no competent suppliers are available, several lead firms often opt for the in-house production. This requires vertical integration of the activities and control exercised by the lead firms (Gereffi&Fernandez-Stark, 2011, p.10).

The new typology demonstrated the differences between these governance structures, since each of them is characterised by different degree of “explicit coordination” between the buyer and the supplier (Lee, 2010, p.2993). The 3 variables used to measure and determine the structures are the complexity of the information between the actors in the chain; how the information for the production can be codified; and the level of supplier competence (Gereffi & Fernandez-Stark, 2011, p.8).

It seems important to mention that the type of governance might change with time and that many GVCs are characterised by multiple and interacting governance structures (Gereffi & Fernandez-Stark, 2011, p.10).

*The social construction of the global value chains* relates to the influence of the institutional context on the dynamics of upgrading within the chains. The importance of this component arises from the embeddedness of the GVCs within local economic, social and institutional dynamics. This embeddedness influences the access to the inputs and labour and conditions thereof (Gereffi&Fernandez-Stark, 2011, p.11) through norms, rules, regulations, conventions and standards developed by different institutions (Lee 2010, p.2997).

For the scope of this paper it seems also important to mention the role of state, since the geographical focus of this thesis will be Germany. The *role of state in the GVCs* is related to both governance and institutional context of the GVCs. One of the criticised points of the whole GVC concept concerns the limited attention of the scholars to the role of state (Brun&Lee, 2017, p.10). Brun and Lee (2017) maintain the idea that interest to the role of state in the last time is growing, since the “core” of the GVCs is moving to the emerging economies. These emerging economies also express a wish to participate in the GVCs, and this might change configurations of value chains. As another reason Brun and Lee mention the limitations of the private governance: companies develop codes and standards that might

influence the industry development, but if not implemented with the help of the state, their effectiveness might be questionable (Pp.10-11).

Brun and Lee (2017) performed an analysis of several cases and concluded that there are at least 5 key roles that a state can have within a GVC. These roles are 1) defining the rules for competition; 2) formulate and perform the GVCs-oriented industrial policy; 3) facilitate networking between home and foreign companies; 4) purchase certain goods as a part of public procurement; 5) create and develop state-owned companies and firms (P.1). In the cases considered by Brun and Lee (2017), the governments actively used law as their main tool. For example, the Korean government adopted the Basic Cultural Industry Promotion Law, in the USA special requirements for the procurement process were formulated, China adopted a number of support measures for the steel companies.

### Global production network

At the same time, an alternative but related to GVC concept, namely, the global production network (GPN) approach emphasizing networking nature of production was suggested (Chaminade&Liu, 2012, p.4). Development of the GPN framework was to certain extent influenced by a number of other concepts, namely, global value chains, global commodity chain, network concepts etc. The concept at stake intended to respond to the critics of the previously mentioned ones, but at the same time admitted the usefulness of some terms suggested by them (Henderson et al., 2002). For example, the global production network approach criticised the linearity of production processes in global value chain by suggesting to include other actors and take into account all the links – horizontal, vertical and diagonal. (Henderson et al., 2002, p.442).

Trying to address the critics towards the GVC concept, the GPN concept claims that production is organised not as chains, but as networks that embrace different actors (both producers and non-producers) in vertical, horizontal and diagonal dimensions across national boundaries. Main GPN actors are companies, states, labour, civil society organisations and consumers (Dicken, 2011, p.60). Actors in GPNs “...struggle over the construction of economic relationships, governance structures, institutional rules and norms and discursive frames...” (Dicken, 2011, p.59; Coe et al., 2008, p.274). Production, distribution and consumption of commodities and services can occur on different levels, but as a result of intensified globalisation more actors from different levels and geographic scales get involved (Dicken, 2011, p.56).

Transforming inputs into outputs is central for the concept of global production networks. It is important to remember that the process flows in two ways, therefore, no comparison with the chain should be done: materials and products flow in one direction, meanwhile information and money go the other way (Ibid.). This core of the production network is influenced by financial system and regulatory framework (includes regulation, coordination and control) (Dicken, 2011, p.57) that are formed by states or intergovernmental organizations. In this regard, it is important to have in mind the embeddedness of the production processes within the territories of other GPN actors – states (Dicken, 2011, p.62).

### *Regulatory role of state in GPN*

Despite the free flow of capital and impressive improvements of logistics and telecommunications, space and place still matter. Various GPN actors can be grounded in various locations, but having a specific location independent on nature of actor is common for them all. Being placed somewhere physically, GPN actors can be also embedded in a social or cultural environment. As to the territorial embeddedness forms, state is claimed to be the most important one, since conditions for the functioning of economic factors are defined by the political frameworks of nation states or through their competence transfer to international organizations (Dicken, 2011, p.62). A state can take a regulatory role when it comes to production processes and economic operations (Dicken, 2011, p.178).

State's regulatory role can be expressed through managing its national economy (Dicken, 2011, p.179) and regulating trade and industry (Dicken, 2011, p.181). There are two main types of managing national economies, namely, fiscal policies and monetary policies (Dicken, 2011, pp.179-181). As to the trade and industry regulating, there are different strategies aimed at 4 different aspects thereof: trade strategies (including policies towards imports and the ones towards exports) (Dicken, 2011, p.182), foreign direct investments strategies (Dicken, 2011, p.184), industry strategies (Dicken, 2011, p.185) and labour market strategies (Dicken, 2011, p.186). Each of these categories includes a broad list of measures<sup>67</sup>. Standards fall within 2 of these categories, namely, trade strategies towards imports (as non-tariff barrier to trade) and industry strategies.

In addition to regulatory role, states in GPN can act as containers of cultural value and economic components, competitors and collaborators (Dicken, 2011, p.169), but these roles do not need to be elaborated for the scope of this paper.

---

<sup>67</sup> For the full overview of the measures see Annex II

## Standards in Global Value Chains /Global Production Networks

While the GVC concept considers national standards as a part of institutional context, international standards, whether set by companies or standardization bodies, relate to the governance component thereof. Some authors, for example, Nadvi (2008) claim that rise of international standards led to decrease of the national regulatory power (P.328). Lee (2010) mentions that more scholars are devoting their research to the question of institutions influence (including standards) on the organisational structure of GVCs and the upgrading strategies. The growing number of standards shaped and enforced by private actors was observed recently and is driving more attention now, since it awakes the interest to the role of these standards in GVCs and their interrelation with governance. The case studies covering this issue usually apply to the agricultural food industry. (Pp.2997-2998).

Ponte and Gibbon (2005) discuss standards as elements of governance, focusing on standards developed by lead firms (P.1). In this case, standards present modular governance structure, since suppliers have to adjust their products depending on the customers (lead firms) requirements. The buyer's/lead firm's need to control the process decreases, since complex information is codified in the form of standards (Gereffi et al., 2005, p.86). The lead firms in such cases can control the access to the value chains (Ponte and Gibbon, 2005, pp.1&22). Applied once, such requirements have potential to become a basis for a global standard, especially if the lead firm has influence on standards development and monitoring process (Nadvi, 2008, p.329).

Nadvi (2008) defines compliance with international standards as a “precondition of the access to the GVCs” (P.323). He considers standards within the GVCs as critical at least in 4 key areas: 1) promoting efficiency; 2) addressing social and environmental aspects; 3) stimulating competition; 4) changing governance patterns and influencing the role of nation states (Ibid, p.326).

As to the GPN framework, national actors, companies and organisations are presented as having equal potential to influence production, varying from case to case, though. National standards here are associated with the states regulatory function. As mentioned previously (Regulatory role of state in GPN), states can perform their regulatory role through managing their national economies and regulating trade and industry. National standards relate to the latter aspect, since standards can play a role of a non-tariff barrier for imported products and are counted as a trade regulation measure (Dicken, 2011, p.182). At the same time, national standards and regulations can be a part of industry strategy as well (Ibid., p.185). National

standards can be implemented by international standard setting bodies and become international ones (Adrian, 2014, p.6).

Intergovernmental (international) institutions also set standards influencing therefore power relations within GPNs. International standards set by standardisation bodies influence both producers and their customers in the end (Hess & Coe, 2005, p.1216). As to de facto standards set by companies, Hess and Coe (2005) mention that companies potential to set them will vary from industry to industry (P.1217).

Taking into account one of the main characteristics of GPN, namely, that actors priorities might differ and cannot be predicted, since they depend on spatial location (Henderson et al., 2002, p.446), it might be supposed that standards development in every industry will depend on a number of individual industry-specific factors. Although main principles of international trade and regional economic cooperation consider standards harmonisation (Standards and competition) as a precondition for fair cooperation, it remains difficult to predict which actor's standards will become dominant in a particular industry.

#### GVC and GPN core concepts to be used

Although there are intersections and similarities between these 2 concepts, it can be stated that each of them has advantages in form of better development of certain aspects. For the scope of this paper, it is necessary to include theory that touches upon standards and their effects on foreign companies operations in German offshore wind market. Standards and standardization will be the central terms of this paper. The research questions aim to find out what standards Norwegian companies from foundations-related segment of value chain have to deal with, how these standards are developed and how they influence activities of Norwegian companies when they establish business in German offshore wind, without specifying the origin of standards. Depending on the origin thereof (expected to be showed by findings), different concepts will be used for the analysis. In case of public standards, GPN's concept of power and regulatory role of state will be used. Although the state standards can be seen as a part of institutional context within the GVC approach, GPN framework suggests more detailed explanation thereof and also explains the motives that lie behind the issue and implementation of state standards. If findings demonstrate that Norwegian actors have to deal with their customers' special requirements (in this case treated as private standards), the concept of modular governance of GVC approach will be used. Private standards in GPNs can be seen as a control tool of the companies in their inter-firm relations, since GPN is also



considered as a contested arena of power relations (Dicken, 2011, p.59). Nevertheless, the GVC approach concentrates more on private standards in this regard.

### Delimitation of conceptual framework

This chapter has included definitions of standardisation and standards necessary for the analytical part of this paper. Standardisation as a process of standards development and enforcement can be driven by different reasons, depending on the standard setting body (private or public). There are two main types of standards - de jure or de facto – with a difference in their enforceability. Officially, standardisation intends to ensure quality and compatibility of products and services, contribute to trade liberalisation etc. Nevertheless, technical standards can also have a constraining effect on trade. In this regard documents ensuring fair competition both at global and the EU/EEA (European Economic Area) level were included in the chapter.

This chapter has introduced the concept of GVC and briefly described some dimensions thereof, namely governance and social construction of the value chains. While the first one focuses on companies interactions and strategies related to the tasks assignments and positioning within the GVCs, the last one addresses the influence of the institutions on the value chains. The chapter has also mentioned the existence of at least 5 different roles that state can perform within the GVCs through the use of law. These roles of state can be considered as institutional context of value chains. GPN framework has also been presented in chapter. Being related to GVC approach, GPN considers states and non-economic organisations as actors capable to influence production processes.

Standards, defined as sets of specific characteristics of the product or process, within GVCs are associated with governance performed by companies, usually lead firms, or institutional context interacting with the GVC at stake. Being set by different actors, public and private, they work as a governance tool. Global standards are believed to shape the access to the value chain, where compliance with them can be a precondition for granting such access. As to GPN, standards relate to power execution and might be used as a tool by all the actors of GPN. Despite the undeniable interrelation between power and governance, no choice was made in favour of one of these concepts. Depending on the findings, different components of both will be used for the analysis. Such decision is based on differences of elaboration on the standards-related aspects in the concepts.

Altogether, the above-mentioned components of this theoretical chapter are supposed to help to analyse the effects of the standards on Norwegian companies trying to establish

themselves in the German offshore wind market and how Norwegian companies cope with these standards.

## Methodology

### Case Study approach

Searching for answers and solutions is considered to be the main goal of most research. The research design depends on the methods one uses to find those answers/solutions (Lapan et al., 2011, p.10). Qualitative research methods will be used in this paper, since qualitative research allows focusing on details of "social and organisational characteristics" (Lapan et al., 2011, p.69).

The research follows a multiple case study approach. Every case in this regard would be defined as a Norwegian supplier's experience with regard to standards in German offshore wind projects. One of the arguments for such choice is that case study approach allows to analyse "complex phenomena" (influence of standardisation process on the foreign suppliers for the paper at stake). Better understanding of this phenomena can be a result of such analysis (Lapan et al., 2011, p.243), since case study allows to examine deeper a single case from a real-world context (Yin, 2014, p.220). As to the choice between multiple and single case study, the first is considered to provide "more robust" results (Yin, 2014, p.57). The research design is often defined by the research question. Since the research question at stake focuses on contemporary events and seeks to investigate what kind of standards Norwegian companies working with foundations design and production have to deal with when they enter the German offshore wind market and how they experience influence of various standards when establishing their activities in German offshore wind market, multiple case study is considered appropriate (Yin, 2014, p.9).

Norwegian companies involved in foundation-production related activities for Alpha Ventus and Nordsee Ost projects will be considered for this paper. Such choice was defined by the necessity to follow replication logic in a multiple-case study (Yin, 2014, p.58). Firstly, it was decided to focus on companies that work with common products, and not the process, since it seems easier to find relevant standards. Secondly, it seemed more logical to pick several companies related to the same value chain segment to provide more data and be able to compare the cases to each other. There are three companies that were involved in the above-mentioned activities in Germany: NorWind, Aker Verdal and Owec Tower. All three were present at Alpha Ventus demonstration project. Aker Verdal was also working at Nordsee Ost later. Although OWEC Tower works with design, while NorWind and Aker Verdal work with construction of foundations, the prediction is that they have to deal with the

same standards operating in Germany. These companies present units of study for the scope of this paper.

### Methods of data collection

Thorough literature review is supposed to be in the beginning of every research (Yin, 2014, p.3). Data for the theoretical part of this paper was mostly collected through literature review. Data needed for the analytical part of this paper has to reflect the experiences of Norwegian companies that worked in German offshore wind sector and the industry context, including existing political, economic and other components thereof. In this regard, the methodological triangulation was chosen, namely, several sources of data are used in this paper (Rothbauer, 2008, p.893). Participatory observation was used to discuss the topic of the thesis and get comments. Additionally, the established contacts helped at the later stage of informants search. Documents review and interviews has been used for data collection.

### *Participant observation*

Defined by Bryman (2012, p.714) as “Research in which the researcher immerses him- or herself in a social setting ... listening to what is said in conversations both between others and with the fieldworker, and asking questions”, participatory observation is also one of the methods of collecting data. Participation in Wind Europe Summit in September 2016 (Hamburg, Germany) can in this regard be considered as participatory observation. It was devoted to the issues related to the current state and further development of offshore and onshore wind.

The event was attended as a part of internship at SINTEF. By that time it was already known that the master thesis will be written about standards role in offshore wind. There were several panels that were possible to attend. The choice, nevertheless, was made in favour of those that could shed some light on either the role of standards in wind sector or challenges related thereto. Additionally, there was an exhibition where different companies with experience from onshore and offshore wind were presented, for example, E.ON, Vattenfall, DNV GL etc. While studying their stands, several companies’ representatives were asked whether they have experience of working in Germany and whether they find it different than in other countries. Although no notes were taken on which companies exactly assessed German rules as more challenging, several statements implied that it might be interesting to look at the German standards and legal framework in offshore wind.

Breakfast followed by presentations was organised by the Intpow – a former network organization for the Norwegian renewable energy industry<sup>68</sup>, today a part of Norwegian energy Partners (NORWEP)<sup>69</sup>. Since not only Norwegian companies' representatives were present, the event allowed to discuss various challenges of offshore wind in other countries, for example, the UK. The discussions encouraged to confirm that master thesis would be written with regard to the standards in Germany.

### *Documents review*

Documents considered to be applicable for almost every case study. Another strength of this data type relates to the easy access thereto, but this at the same time can be a disadvantage. Nevertheless, it is still appropriate to use them, if carefully and critically. It is also recommended to focus on the relevance of the documents used (Yin, 2014, pp.105-109). As to this paper, official documents were used (Bryman, 2012, p.543), namely, programmes and laws, guidelines and regulations, mass media articles, evaluations and reports related to the industry development. These can be divided into several categories: official documents deriving from state, official documents deriving from private sources and mass-media outputs (Ibid., pp.549-553). It is recommended, though, when working with documents to take into account their context and target audience. It is also important to remember that a document would reflect the opinions of the authors and, therefore, try to make an impression suitable for them (Ibid., 554-555).

### *Interviews*

Interviews is one of the most important data collection methods often used for case study (Lapan et al., 2011, p.256; Yin, 2014, p.110). This method is considered as important, since it can provide deeper insights into the studied issue, especially if the interviewees possess the necessary information (Yin, 2014, p.113). The interviews conducted for this paper did not take longer than 2 hours and were more focused on the experiences within German market, therefore, they can be defined as shorter case study interviews in accordance with classification suggested by Yin (2014). The interviews were semi-structured (intended to cover certain topics) based on the interview guide, but remained more as informal conversation with higher degree of flexibility (Hay, 2010, p.110; Bryman, 2008, p.471). One of the interviews was conducted in person, meanwhile 2 others were phone interviews (the

---

<sup>68</sup> Norwegian Energy Partners (2017). What was Intpow? Retrieved 27.04.2017 from <http://www.norwep.com/About/What-was-INTPOW>

<sup>69</sup> Norwegian Energy Partners (2017). About. Retrieved 27.04.2017 from <http://www.norwep.com/About>

interviewees chose such format). Although it has some advantages, for example, cost reduction (Bryman, 2008, p.488), one of the disadvantages was experienced while conducting this research. Namely, time limitations/possible termination of the conversation might have influenced the data collection. One of the participants warned in advance that he had 30 minutes only. Another disadvantage is not seeing the body language (Ibid.) Overall, the search ended by arrangement of at least 1 interview with 1 representative of all the above-mentioned companies. All the interviews were recorded. The informants were asked for consent before the recording, which can be considered as informed consent (Yin, 2014, p.78). The recording started after the permission was granted. Recording was not used only to ease the process allowing for not taking notes, but it is also considered important to be able to assess the way of words being said (Bryman, 2008, p.482). The interviews were transcribed. Some informants preferred to get the interview questions in advance and opted for answering them in written form. Data collected through this written exchange was used concerning the standards development in Germany and does not deal with the experience of Norwegian companies operating in German offshore wind.

#### Informants choice and establishing contact

Having limited the number of companies to the ones that were involved in foundations value chain segment of German projects, the search for the informants started with LinkedIn. Using "Alpha Ventus", "Nordsee Ost" and companies names (Norwind, OWEC Tower and Aker Verdal) as searching terms, a number of potential informants was identified. It was decided not to use the period of the project as search terms for LinkedIn, since the managers could have joined the project at different time. Therefore, they would have included only their working time at the project, and it would require many different combinations search and prolong the whole process. At the same time, NORWEP representative was contacted. He provided a number of potential informants. By that time some of them were already contacted. When contacting them, some information on the research project and research question of the master thesis was provided. Some of the contacted people never replied, meanwhile some others admitted that their experience did not have much to do with the issues at stake. Several of the latter forwarded the e-mails to people who, in their opinion, could possess relevant information or provided the contacts of potential informants.

In cases of several companies LinkedIn search did not bring any results that could be used for the informants' selection. Therefore, it was decided to contact the company directly by phone numbers provided at their homepages. In cases where information on CEO was

given, the CEOs were contacted. 1 cable supplier's office manager confirmed the participation of their company in Alpha Ventus, but refused to provide more information or forward the call to potential informants and refused to provide the reasons. Another company's representative (chief executive officer) confirmed their participation in Alpha Ventus, but could not participate due to the company's "difficult times" and therefore the need to use resources accordingly. Representative of a vessel supplying company agreed on participation, but warned in advance that he doubted that he could contribute significantly to the topic of the research. The reason for the doubts was explained by lack of any special rules for the vessel suppliers. This exchange contributed to the decision to focus on products suppliers, and not the service suppliers.

### Data analysis

There are 4 main strategies for a case study data analysis: relying on theoretical propositions, working data from the "ground-up" (Yin, 2014, p.136), developing a case description (Ibid., p.139) and examining plausible rival explanations. Nevertheless, it is also stated that case study analysis often depends on a number of decisions made by the researcher himself, his/her way of thinking etc. (Yin, 2014, p.133). Initially there were some expectations concerning potential outcomes of the research. Namely, it was expected that Norwegian companies might consider German standards as difficult to deal with. At the same time, it was also predicted that German national standards most probably cannot construe a barrier to trade due to German obligations within the EU. The theoretical chapter provided a number of effects that standards can have, whether set by private companies or state.

After having transcribed the interviews, coding was started. The codes were developed in advance, based on the interview guide and inspired by the interviews during transcribing. Such examples as Alpha Ventus, challenges, standards, risks can be mentioned here. The interview guide was developed taking into account the theoretical concepts informing this study. While coding, several new codes appeared to be relevant and were included, for example, responsibility sharing in offshore wind.

Having coded the data collected through the interviews, the main findings were grouped in a table. It was noticed that informants easily switched to topics related to standardisation, but not necessarily relevant to the research question. For example, answering what role standards played for their activities, the answer could elaborate on other challenges met when operating in Germany.

Overall, there are 5 analytic techniques that might be used in case studies. In this paper pattern matching is used. Pattern matching technique prescribes matching of predicted patterns with the ones resulting from data (Yin, 2014, pp.143-147). Namely, various 2 main standards roles were compared to the goals of standardization activities of both states and standard developing bodies. These “roles” were also compared to the experiences of the cases companies when working in Germany. As to the private standards, one governance structure (see Theory chapter) was expected to be experienced by the Norwegian companies. Nevertheless, the results demonstrated presence of elements of other structures as well.

### Methodological basis of the paper - summary

This chapter has described research design and data collection methods of this paper. It has also touched upon the analysis logic followed for this paper. Choosing qualitative research as design strategy, the paper follows multiple case study approach. Every case relates to the experience of a Norwegian company working in the foundations segment of value chain in the German offshore wind market. While 2 of the 3 case companies were active only in Alpha Ventus offshore wind project, one of them was also working for Nordsee Ost afterwards. Three methods were used for the data collection. Participatory observation was used to learn about the field, discuss the topic, get valuable comments, specify the research question and get contacts that could provide information on the potential informants. Documents review and interviews were used to collect the data about the context of standards development and offshore wind development in Germany and experience of Norwegian companies with regard to the standards in German offshore wind market. This chapter has also provided a detailed description of the choice of the informants and the process of getting in contact with them, since the access to the informants has influenced the quality of this paper. The following chapter will elaborate thereon.



## Research quality, limitations and ethical considerations

### Research quality and limitations

According to Yin (2014, p.45) every social research can be checked for 4 logical tests. These tests show a lot about the quality of the research. In order to increase construct validity of the case study research, Yin (2014, p.45) recommends use of several sources of evidence/methods of data collection. This is defined as methodological triangulation and is supposed to help the better understanding of phenomena at stake (Rothbauer, 2008, p.893). The interviews remain the main source for data related directly to companies' experiences. Such sources of data as laws, regulations, guidelines, media articles and 4C Offshore data were used for the collection of information necessary for better understanding of the standards development process and context thereof. 4C Offshore is a consultancy and market research firm with a focus on offshore wind projects.<sup>70</sup> During the internship, one of the tasks assigned related to work with 4C Offshore's databases. This helped to get a structured overview of Norwegian companies involved in German offshore wind projects. In addition, 4C Offshore's homepage provides information about supply chain, main events, vessels working on the offshore wind farms all over the world, including 151 project in Germany. The 4C Offshore's homepage was referred to after the internship was completed. Initial plan was to contact several representatives of the same companies, but informants' availability was lower than expected. 1 informant considered as relevant by other informants did not share this opinion and refused to participate.

Yin (2014, p.128) also recommends to establish a chain of evidence. In this regard, he suggests coming up with a potential conclusion of the case first and then trying to identify the steps that would help to find necessary information. Since none of the case companies is present in German offshore wind today and German standards are considered to be difficult to deal with by some foreign companies, for example, the US,<sup>71</sup> the initial thought was that there might be a connection between the leave of the market and the standards therein that Norwegian companies face. In this regard, it seemed logical to find out what standards Norwegian companies deal with, how these standards are developed, whether they are

---

<sup>70</sup> 4C Offshore (2017). Who We Are? Retrieved from <http://www.4c offshore.com/windfarms/about-us.aspx>

<sup>71</sup> Export.gov. (2017) Market Research on Germany: Country Commercial Guide. Trade Regulations, Customs and Standards. Retrieved 27.04.2017 from <http://2016.export.gov/germany/marketresearchongermany/countrycommercialguide/traderegulationsandstandards/index.asp>

obligatory or not etc. It was also important to find out how Norwegian supply companies perceive these standards.

Following replication logic when choosing the cases that is supposed to increase the external validity of the paper (Yin, 2014, p.45).

Additionally, informants provided no or little data on the cooperation with client and client's requirements. The contracts themselves were not available either. Nevertheless, some general information on the differences in client-supplier relations between offshore wind and offshore oil and gas was provided.

### Ethical considerations

Main ethical concern in social research relates to the anonymity of the "human subjects" who provide the information or are studied by the researcher (Yin, 2014, p.77). It is recommended to disclose the identities of both the case and individuals, since this would help the reader to make connections between the case and information thereon he/she might have heard previously. At the same time, it also helps the researcher to check all the necessary information, quotes etc. (Ibid., p.197). Yin (2014, p.197) provides a number of situations where anonymity should be granted. Namely, if the study related to a controversial topic, may affect the actions of the subjects at stake in future, concerns a vulnerable group of people. In chosen cases it is interesting how relationship with clients was built and what kind of requirements clients imposed on their suppliers. This might be a sensitive aspect, since it relates to companies' business strategies. Additionally, one of the companies is going through the arbitration process and therefore could not provide much information on the relation with the client. Therefore, it was decided to disclose only the names of the companies. Informants' names are not included. It was also considered necessary to exclude all the information that would make it possible to connect a company to a concrete situation where informants share their experiences of working with clients. In the part devoted to the client-supplier interactions no link to concrete companies will be made, instead "supplier's representative" or "representative of one of the case companies" is used. An exception for this category relates to the experience of Kværner Verdal during Nordsee Ost, since they were the only Norwegian foundations supplier in this project. The informed consent was obtained in this regard.

The information collected through interviews was sent to the informants before the submission. This has enabled them to go through the text and control whether there is any information that should be removed. In most cases, it was slightly adjusted with no big implications for the analysis. In one case, the company's representative removed the

information related to the offshore wind activities of the company after the Alpha Ventus project. The final text was also sent to the informants. In one of the three cases, the informant did not reply. Therefore, it had to be checked whether this particular informant provided any information that might be sensitive.

In this chapter research quality, limitations and ethical considerations have been addressed. Overall, it is expected that companies and informants choice together with data triangulation contribute to the quality of this paper. Main limitations relate to the number of informants caused by time conditions and informants' availability and willingness to share their experiences.



## Analysis of standards framework in German offshore wind projects and its implications for the case companies

The following chapter will focus on the analysis of main findings. Since the case companies were involved in Alpha Ventus, German first big offshore wind project, the initial point of answering the research questions would relate to the standards that formed a basis for the operations of these companies. While in accordance with the chosen theoretical framework, standards can play different roles, it seems interesting to look at the process of development of main standards that were used for Alpha Ventus. Additionally, it is also important to see how Alpha Ventus was used for the improvement of the existing standards. Answering the questions why they were developed and who contributed thereto will lead us to the main roles that the standards at stake can have. Afterwards, it seems logical to see how Norwegian companies assess these standards and whether the standards have influenced their activities to some extent.

The following paragraph serves as a short reminder of the main theoretical concepts and definitions that are used for the analysis.

Standard is defined as a “set of technical characteristics/specifications that a producer adheres to” (David&Greenstein, 1990, p.4). Standards belong to the institutional context if developed by institutions whether national or international. Set by companies they can also be seen as lead firms’ governance strategy, namely, modular governance structure from the GVC perspective. As to the GPN concept, standards are seen as regulatory tools of state to create framework for trade and industry.

### Standards framework in Alpha Ventus

#### *BSH standards*

Shortly before the start of the construction phase of Alpha Ventus (25th of June in 2008), the BSH issued several standards.<sup>72</sup> One of the standards - Standard Ground Investigations – was updated in 2008. BSH standards in this regard are de-jure standards issued by a governmental institution. The standards can be seen as indirectly binding, since compliance with them is required for the project approval.

Immature industries can be characterised by the lack of commonly accepted standards, since standard creation is a consequence of progress in industry (Metcalf and Miles, 1994,

---

<sup>72</sup> Standard "Investigation of the Impacts of Offshore Wind Turbines on the Marine Environment (StUK3)" and Standard "Design of Offshore Wind Turbines" were both issued in 2007

p.250). The BSH standards were issued as a result of the industry development and consequent need for more project security. The wish to have standards as a benchmark was expressed by the maritime industry representatives.<sup>73</sup> A number of industry representatives, scientists, economists and internationally active certification bodies contributed to the standard development process. A number of professional unions and organisations had a possibility to comment on the drafts. Among them Offshore Wind Foundation (Stiftung Offshore Wind, SOW), Offshore Forum Wind Energy (Offshore Forum Windenergie, OFW), the Offshore Wind Energy Working Group (Die Arbeitsgemeinschaft Offshore-Windenergie, AGOW), Trade Association of Windpower Plants (Wirtschaftsverband Windkraftwerke e.V., WVV), Wind Energy Agency (Windenergie-Agentur, WAB), Association of German Manufacturing Systems and Plant Construction and Engineering (Verband Deutscher Maschinen und Anlagenbau, VDMA), Association for Shipbuilding and Marine Engineering (Verband für Schiffbau und Meerestechnik, VSM<sup>74</sup>) were present.<sup>75</sup>

The BSH standards are based on Eurocodes<sup>76</sup> with several practices drawn from a number of international documents.<sup>77</sup> The latter ones were used to cover the gaps left by the Eurocodes. Deviation from the BSH standards is possible, but existence of such a need has to be communicated in advance and equivalence of the suggested alternative has to be proven to the BSH. The standards are claimed to comply with the EU Regulations and Guidelines.<sup>78</sup> The BSH standards, therefore, present first of all an example of cooperation between companies, state and certification bodies (Blind&Mangelsdorf, 2016, p.14), but more importantly an example of the state's response to the industry's needs and wishes. Here the industry encourages the state to develop standards (Menzel&Grillitsch, 2014, p.6). Additionally, several certification bodies operating internationally participated in standards development. Therefore, they could influence national standards in Germany from an international point of view. At this point, it seems logical to consider additionally how main participants of the BSH standards development process see standardisation.

---

<sup>73</sup> Although the informant did not explicitly describe the maritime industry representatives as German ones, it can be supposed that he was talking about them since German national institution would most logically react to the needs of the domestic companies

<sup>74</sup> The names of German actors were translated by the author, this is not the official translation and might be different from the one used by the actors themselves

<sup>75</sup> M. Zeiler on behalf of N.Nolte (written communication, 14.03.2017)

<sup>76</sup> Reference design codes intended to promote harmonization of the internal market for construction products and engineering services

<sup>77</sup> API RP 2A-WSD (Planning, Designing and Constructing Fixed Offshore Platforms – Working Stress Design), DNV-OS-J101 (Design of Offshore Wind Turbine Structures), DNV-RP-C205 (Environmental conditions and environmental loads), DIN EN ISO 19901-6 (Petroleum and natural gas industries – Specific requirements for offshore structures – Part 6: Marine operations).

<sup>78</sup> M. Zeiler on behalf of N.Nolte (written communication, 14.03.2017)

### *Local contributors to BSH standards development*

The background chapter has already mentioned the main features of German standardisation strategy. To sum up, German standardisation is intended to secure Germany's position as a leading industrial nation; support successful society and economy; ensure deregulation; promote technological convergence and provide efficient procedures and tools.<sup>79</sup> Since the BSH standards refer to a number of international documents and a number of experts contributed to their development, it seems logical to have a look at some of them.

One of the documents that shaped today's BSH standards (see Background chapter) was issued by the International Organization for Standardization (ISO). The German Institute for Standardization (DIN) was involved in its preparation as well.<sup>80</sup> Registered as a private non-profit organisation based in Berlin, DIN claims itself as "one of the world's leaders in standardisation".<sup>81</sup> States can mandate development of necessary standards to the recognised standardisation bodies (Blind&Mangelsdorf, 2016, p.14). In accordance with the Standards Agreement signed between DIN and the German Federal Republic, the Federal Republic recognizes DIN as its competent standards organisation.<sup>82</sup> Therefore, it seems interesting to have a look at DIN's understanding of standards and standardisation goals. Standard in DIN's interpretation is similar to the definition provided in the theory chapter. According to DIN, "standard is a document that specifies requirements for products, services and/or processes, laying down their required characteristics. This helps ensure the free movement of goods and encourages exports".<sup>83</sup> Here we see that DIN's definition of standard can be covered by GPN's understanding of standard as an industry strategy component. Being a German national standardisation body, DIN logically is supposed to contribute to the development of the country's economy. This would explain why "encourages exports" is named among the goals of standards development. As to the standards development, DIN considers it necessary to reflect the interests of all potential stakeholders, therefore, transparency is important.<sup>84</sup> Additionally, regular review is intended to ensure that existing standards reflect the industry

---

<sup>79</sup> DIN German Institute for Standardization (2013). The German Standardization Strategy: an update. Retrieved 20.03.2017 from

[http://www.iso.org/sites/PEG/docs/PEG%20Documents/08\\_DNS\\_2010e\\_akt.pdf](http://www.iso.org/sites/PEG/docs/PEG%20Documents/08_DNS_2010e_akt.pdf), p. 3

<sup>80</sup> Beuth publishing DIN (2017). DIN EN ISO 19901-6: 2012-03. Retrieved 23.04.2017 from <https://www.beuth.de/en/standard/din-en-iso-19901-6/149667376>

<sup>81</sup> DIN (2017). DIN e.V. Retrieved 23.04.2017 from <http://www.din.de/en/din-and-our-partners/din-e-v>

<sup>82</sup> DIN (2017). Contract between the Federal Republic of Germany and DIN German Standards Institution. Retrieved 23.04.2017 from

<http://www.din.de/blob/79650/76ad884fb2c4dd6aa5b900e7a1574da6/contract-din-and-brd-data.pdf>

<sup>83</sup> DIN (2017). A brief introduction to standards. Retrieved 23.04.2017 from

<http://www.din.de/en/about-standards/a-brief-introduction-to-standards>

<sup>84</sup> DIN (2015). Statutes. Retrieved 23.04.2017 from

<http://www.din.de/blob/66170/0ad27759be047557cf7654e1f4df824d/din-satzung-en-data.pdf>

reality.<sup>85</sup> Standards tend to change over time in order to cover new important aspects or product qualities (Menzel and Grillitsch, 2014, p.6). DIN standards do not construe an exception in this regard.

DIN encourages companies to participate in standardisation, since it can help to promote global trade through elimination of non-tariff barriers thereto<sup>86</sup>, save corporate costs through the reflection of companies' interests in standards<sup>87</sup>, increase innovative capabilities of companies<sup>88</sup>. DIN also created a platform for small and medium enterprises (SMEs) that helps them to be updated and exchange information concerning current standardisation developments, since it has been claimed difficult for companies of such size to participate in standardisation.<sup>89</sup> The main benefit for the public sector lies in deregulation of the industry: state does not have to focus on technical details, but only overall issues and can, therefore, use resources in other areas.<sup>90</sup> DIN is, therefore, an example of "platform" where collaboration between state and private companies occurs, as suggested by Blind&Mangelsdorf (2016, p.14). Standards created by DIN with the state's "permission", reflect at the same time the interests of the main stakeholders. DIN represents German interests at the international level, for example, within ISO and takes care of incorporation of international and European standards in the national ones.<sup>91</sup> At the same time, a number of bodies operating internationally has also contributed to the development of BSH standards. Their role was limited to providing expert opinions.

### *International experts in BSH standards development*

Several practices were drawn from the documents developed by DNV GL. DNV GL is an international organisation that was established following a merger between DNV (Det Norske Veritas) and GL (Germanischer Lloyd) in 2013.<sup>92</sup> Intended to contribute to life safety and environment protection, DNV GL provides various services, including certification. The

---

<sup>85</sup> Ibid.

<sup>86</sup> DIN (2017). Global trade. Retrieved 23.04.2017 from <http://www.din.de/en/about-standards/benefits-for-the-private-sector/global-trade>

<sup>87</sup> DIN (2017). Using standards brings costs savings. Retrieved 23.04.2017 from <http://www.din.de/en/about-standards/benefits-for-the-private-sector/cost-savings>

<sup>88</sup> DIN (2017). Promoting innovation. Retrieved 23.04.2017 from <http://www.din.de/en/about-standards/benefits-for-the-private-sector/promoting-innovation>

<sup>89</sup> DIN (2017). SME Commission (KOMMIT). Retrieved 23.04.2017 from <http://www.din.de/en/about-standards/benefits-for-the-private-sector/sme-commission-kommit>

<sup>90</sup> DIN (2017). Benefits for the public sector. Retrieved 23.04.2017 from <http://www.din.de/en/about-standards/benefits-for-the-public-sector>

<sup>91</sup> DIN (2017). DIN and international standardization. Retrieved 30.04.2017 from <http://www.din.de/en/din-and-our-partners/din-and-international-standardization>

<sup>92</sup> DNV GL (2016). Our history. Retrieved 24.04.2017 from <https://www.dnvgl.com/about/in-brief/our-history.html>



company also engages in standards, rules and guidelines development.<sup>93</sup> According to the company's documents, standards are developed to cover technical requirements in different areas. Standards are based on the company's experiences in certification, classification, verification and training.<sup>94</sup>

As to the DNV GL standards that influenced formation of the BSH standards, DNV-OS-J101 (Design of Offshore Wind Turbine Structures) was mentioned. The first one defines „minimum requirements for structures and structural components“. The standard at stake can be combined with other standards and recommendations. Whether in combination or on its own, the standard can be referred to in contracts or play a role of a guideline.<sup>95</sup> BSH standards also refer to some recommended practices issued by DNV GL, namely, DNV-RP-C205 (Environmental conditions and environmental loads). DNV GL standards here are an example of standards issued by a global certification body. While applied voluntarily, they can still influence the access to the value chain, if the lead company will require compliance with a particular standard. In this regard, it is up to the lead firm which standards to use and whether to make compliance with them mandatory or desirable. The state can also opt for the use of a particular standard as a benchmark in its obligatory procedures. In this case, standards developed by the global standardisation bodies will unlikely distort the fair competition or hinder global trade. Nevertheless, one of the main challenges in the development of global standards relates to the lack of universality.<sup>96</sup> Therefore, even applying some global standards both state and client company might need to add more specific requirements.

Additionally, SGS and Lloyd's Register also acted as experts for the BSH standards development. Lloyd's Register is a global organisation that provides business, engineering and technical services.<sup>97</sup> Among these services Lloyd's Register sets standards for offshore installations and ships. This information is supposed to help companies with classification of their products and services. Lloyd's Register does its research continuously in order to ensure its standards reflecting the modern technology developments, market trends and legal

---

<sup>93</sup> DNV GL (2016). DNV GL in brief. Retrieved 24.04.2017 from <https://www.dnvgl.com/about/index.html>

<sup>94</sup> DNV (2014). Summary of changes. Retrieved 24.04.2017 from <http://rules.dnvgl.com/docs/pdf/DNV/codes/docs/2014-11/Main-changes.pdf>

<sup>95</sup> DNV (2014). Design of Offshore Wind turbine Structures. Retrieved 24.04.2017 from <https://rules.dnvgl.com/docs/pdf/DNV/codes/docs/2014-05/Os-J101.pdf>

<sup>96</sup> Wind Power Monthly (2012). The ongoing effort to globalise standards. Retrieved 15.03.2017 from <http://www.windpowermonthly.com/article/1114328/ongoing-effort-globalise-standards>

<sup>97</sup> Lloyd's Register (2016). Lloyd's Register – improving safety, quality and performance. Retrieved 24.04.2017 from <http://www.lr.org/en/>

framework changes.<sup>98</sup> As to SGS, it's a company with international expertise providing services to companies. Their services relate to inspection, testing, verification and certification of companies products and services. The company works both with international and local standards.<sup>99</sup> Although, no information was found on the standards issued by the company at stake, their expertise in this field can be proven by years-long experience and a number of local offices all around the world.

### *Alpha Ventus to contribute to standards development*

Despite the presence of the above-mentioned standards by the start of the Alpha Ventus project, some of the informants mentioned that Alpha Ventus was intended to contribute to the framework development: "But German authorities used this project [Alpha Ventus] to go through and develop rules for wind turbines in German waters" (former NorWind's employee). Taking into account that de-jure standards "are more important in mature industries" (Menzel&Grillitsch, 2014, p.5) and that Alpha Ventus was a first big German project in offshore wind, it is possible to state that standards were still in the development phase by that time. Although, several standards were already developed by the start of Alpha Ventus, there might have been different reasons for changes or development of new ones. For example, limited scope of the existing standard, rise of new important aspects or product qualities that need codification etc. (Menzel&Grillitsch, 2014). In this regard, we can also think about innovative solutions as a reason to adjust the existing standards, since the Alpha Ventus project was meant to test new technologies and produce knowledge that could be used for further development of permitting procedures, safety audits, tendering process etc.<sup>100</sup>

### *Nordsee Ost: still developing standards*

Although only one of the case companies continued their activities in German offshore wind market after Alpha Ventus, their experience is important to understand how development of the standards framework was progressing, if at all. Kværner representatives pointed out that by the time of entering the contract with their client in Nordsee Ost, no certain benchmark in the form of standards was available yet:

---

<sup>98</sup> Lloyd's Register (2016). Rules and Regulations. Retrieved 24.04.2017 from <http://www.lr.org/en/RulesandRegulations/>

<sup>99</sup> SGS (2017). SGS in brief. Retrieved 24.04.2017 from <http://www.sgs.com/en/our-company/about-sgs/sgs-in-brief>

<sup>100</sup> Federal Ministry of Economics and Energy (2015). Fact-Sheet Alpha Ventus. Retrieved 20.04.2017 from [https://www.alpha-ventus.de/fileadmin/Dateien/publikationen/av\\_Factsheet\\_Engl\\_2016.pdf](https://www.alpha-ventus.de/fileadmin/Dateien/publikationen/av_Factsheet_Engl_2016.pdf)

”In Germany there is the BSH (the public certification body) and their word is law. ...We entered into the contract in June 2010, and almost 1 year later and after we had started construction, several decisions on which standards should be applicable were still not made”.

Despite lacking reference point at the beginning, some standards must have been agreed on. Nevertheless, some changes were required: “According to the framework in force it is required to have an expert on ground conditions within the project, they had an expert there (in Nordsee Ost). For some reason they decided that they additionally wanted to get a consultation from a professor on soil working at one university in Central Germany. Suddenly afterwards came requirements that were far away from the ones that were used as the basis for the offer.” Without having access to the contract itself, it is difficult to assess the extent of influence that such changes can cause. Nevertheless, Kværner supplied the required foundations in accordance with the new requirements. At the same time, the company’s experience in Nordsee Ost became one of the reasons why it was decided “not to follow up on this market afterwards” and instead “concentrate on oil and gas”. In this regard, it is interesting what exactly might have caused such decision.

### Challenges experienced in German offshore wind by the case companies

Although none of the 3 Norwegian companies studied is present in German offshore wind market today, only one of them connected their leave of German offshore wind market to their experiences with the standards framework to certain extent. It has to be emphasised that all of them mentioned several challenges that were faced while working with German projects. These reasons include, for example, grid connection, use of local language and risks sharing.

### *Responsibility sharing*

Here it has to be mentioned that offshore wind differs from oil and gas when it comes to responsibility sharing in general. Namely, the client in offshore wind tends to be less willing to take more responsibility in case of unexpected changes or practices known from oil and gas: “In most of Norwegian offshore contracts it would be the client who takes the costs for weather waiting.”; “...the client never wants to take risk and pay for this kind of changes. A small [company] will never be able to take the complete responsibility if there is a change in the guidelines”; “...if there are changes in design premises, then changes-related work has to be compensated....But not here. In offshore wind this understanding was clearly different”. As mentioned before, profits in offshore wind are lower than in oil and gas and financial risks higher, therefore, such responsibility sharing is not surprising. At the same time, taking into

account the size of the Norwegian actors, it is also easy to imagine how damageable unexpected changes not covered by the client might be for their future activities.

On one side, it has already been mentioned that standards can and should be updated in order to capture all the changes and address the challenges experienced previously (Menzel&Grillitsch, 2014). On the other hand, complying with new governance regime in offshore wind is important enough in itself (Steen&Hansen, 2013, p.15). When this regime changes, it can be very challenging to adjust. The OWEC representative mentions the importance of following such development processes: “.... you follow the drafts, and if you’re a little bit clever [you] consider it even if it’s not an official request.” This can be challenging, though, if the company does not have the resources or has to take too high risks. The example of Kværner Verdal demonstrates that changed standards can be managed and production can still be adjusted. The question, though, remains, the responsibility in such situations.

#### *Possibilities for the case companies to influence the development of BSH standards*

The theory chapter suggests cooperation possibilities for companies and states through cooperation bodies. Here, according to the former NorWind’s employee, it was possible even for foreign companies to influence the framework at its development stage “to certain extent”: “...It was an advantage that there were not so many rules. In certain situations it is possible to cooperate with the authorities, in a way that rules are developed during the project and test different rules during the project”. Important in this regard is that the demonstration nature of the Alpha Ventus project allowed for suggesting new technologies and tests, at the same time with the standards adjustment. Nevertheless, no findings prove that the existing offshore wind framework in Germany was actually influenced by the Norwegian companies during Alpha Ventus project, since the existing BSH standards are claimed to use Eurocodes as the basis. Additionally, it has to be mentioned that GVC concept states that private standards are set by lead firms within the value chain, and the three Norwegian companies studied in this paper cannot be classified as belonging to this category. As to the national standards as a mechanism regulating industry, it seems more logical of German authorities to include suggestions coming from the domestic companies. One might argue that Norwegian companies could still influence the framework through their practical performance, providing outstanding results or innovative solutions. Nevertheless, as mentioned by OWEC representative, it has not always been easy to get the proposals approved:

If you want to make a grouted connection as we do, for example, between jacket and foundation, on the piles, then you have to get this cement accepted. [This is] what they call a “single case approval”. [T]his has to be approved by an expert. And then it’s a completely open discussion because it’s single case approval.

In this regard, it can be argued that suggesting innovative solutions or solutions based on the previous practices of Norwegian companies would prolong the whole process. A long discussion would be started and the experts will have to go through the evidence and confirm the interchangeability of the suggested practice and the usual one. It has to be kept in mind that time is very important for such projects. Therefore, it seems more probable that suppliers would consider the practices that are easier to get approved.

Nevertheless, since the BSH has involved several international experts in their standards development process, it can also be argued that Norwegian companies might have had a possibility to influence the standards indirectly. For example, DNV GL is also active in Norway<sup>101</sup> and appeared as a result of a merger of a German and a Norwegian companies<sup>102</sup>. Participating in DNV GL standard development, therefore, could be a way for the Norwegian companies to have some indirect influence on the national standards of the third countries. The question that would be important here, though, is to what extent DNV GL’s practices were taken into account for the BSH standards and whether the companies at stake have participated in the development of exactly those practices.

### National standards as a tool to develop own industry

The OWEC representative mentions a common challenge in standards development without necessarily connecting it to his Alpha Ventus experience: “the ways to achieve this safety are not the same in different countries”. As to the question how local companies handle the bureaucratic procedures in Germany, the OWEC representative mentioned another factor that might be beneficial when operating abroad:

...of course it’s an advantage for local companies, it’s easier for them than for the foreign companies. We’ve seen it already in the past that foreign companies just gave up German market or had to team up with some local company to progress in the German market. Without a local partner it would be very difficult. ... Even if not officially, but you will end up working with local people, and you will have some local content.

---

<sup>101</sup> DNV GL (2017). DNV GL. Retrieved 30.04.2017 from <https://www.dnvgl.no/>

<sup>102</sup> Almeida, R. (2012). DNV and GL Group announce landmark merger. Retrieved 30.04.2017 from <http://gcaptain.com/group-announce-landmark-merger/>

Despite the explicit intentions of German institutions to support German companies, we can see that standards, if formulated in an unusual way for foreign companies or based on practices from different sector, can lead to increased cooperation between local companies and foreign companies or exclusion of the foreign companies. If a foreign company with many years of experience in, for example, offshore oil and gas wishes to establish itself in a new market where onshore experience is taken as a basis, it would need a partner in the form of a domestic company that knows how to tackle the framework. Here national standards can work as industry strategies (GPN approach) and help the state to regulate industry development through creation of favourable conditions for domestic companies and indirect force of foreign companies to create cooperation forms with local companies or hire local experts in order to ease their activities in the market at stake.

Although national standards are believed to play a significant role for the liberalisation of international trade (Blind&Mangelsdorf, 2016, p.13), in some cases they could function as non-tariff barrier to trade. As mentioned by the OWEC representative, various practices would be easier to deal with for certain companies, most probably, the local ones who contributed to their development. Also seen as an instrument to increase competitiveness of the national economies (Blind&Mangelsdorf, 2016, p.13), national standards can exclude foreign companies through application of over-sophisticated national standards and therefore increase the percentage of local content in the value change at stake. It has to be kept in mind that, despite a number of exceptions, local content requirement is considered as incompatible with the principles of unrestricted trade and fair competition by WTO and EU.<sup>103</sup>

### Path dependence in standards development

All the informants from the case companies agreed on being familiar with standards from a different sector, namely, based on the offshore oil and gas experience. For example, OWEC Tower's representative mentioned the use of onshore experience also by the BSH:

In Germany, in wind offshore, you have to be compliant with some local regulation defined by the BSH-Administration that will be in charge of everything that will be done in the sea. ... There is nothing experienced from oil and gas and not so much happened in the sea before offshore wind came, therefore the basis was quite weak, more based on the onshore experience.

---

<sup>103</sup> International Centre for Trade and Sustainable Development (2008). TRIMs and Local Content. Bridges Retrieved 20.04.2017 from <http://www.ictsd.org/bridges-news/bridges/news/trims-local-content>; Warner (2011). Local content in procurement: creating local jobs and competitive domestic industries in supply chains. Sheffield, Greenleaf Publishing, pp.29-34

The Kværner representative mentioned the similarities between the UK and Norway: “In the UK, that has the same history as Norway, they picked up what they considered a relevant framework (standards and specifications) from offshore oil and gas and adapted it.” In the UK experience from offshore oil and gas has, therefore, influenced the framework in offshore wind. While framework in the UK was based on the experience similar to the Norwegian, Germany used more onshore experience to draw the rules for the industry: “Germany has no offshore industry, and neither have they the same basis”. In this regard, it can be supposed that working in a new rules context would be more challenging for the Norwegian companies. The reason for that could be their broader experience with offshore oil and gas practices. Kværner did, in fact, characterise working with such framework more challenging than somewhere else, where offshore oil and gas experience was used as a basis: “It has been very difficult, meanwhile we see in the UK that it has been much more specific criteria and design processes and framework that helped to make things predictable”. While OWEC representative mentioned that standards are needed in general to provide “more confidence”, Kværner’s representative pointed out that working with “usual” standards and practices is significant to increase the predictability. The difference in the experiences of these two companies can be, probably, explained by the companies’ history. While OWEC worked with offshore constructions in renewable energy sector since the first day of their establishment<sup>104</sup> and, therefore, had already 3 years of experience of working in offshore wind, Alpha Ventus was a first offshore project for Kværner. Before that, the latter was working exclusively with oil and gas. It can, therefore, be supposed, that OWEC was better prepared for working in new context, namely, with Alpha Ventus project.

As mentioned by Steen and Hansen (2013), Norwegian companies operating in offshore wind are representatives of petro-maritime or oil and gas industries (P.2037) and bring therefore different knowledge when operating in offshore wind (Ibid., p.2045). While more complex offshore farm projects are characterised by increased involvement of the actors from offshore oil and gas, originally offshore wind was considered as a branch of onshore wind (Ibid). Lack of offshore practices in German national standards claimed by the representatives of Norwegian companies can be explained by the fact that offshore firms in Germany diversified from onshore wind and other industries, for example, steel construction, construction and logistics. Some of them had worked in offshore oil and gas, though (Fornahl et al., 2012, p.848). In both cases we see that offshore wind was influenced by other

---

<sup>104</sup> OWEC Tower AS (2013). Company. Retrieved 30.04.2017 from <http://www.owectower.no/company/>

industries. While offshore wind in the UK and Norway was influenced by offshore oil and gas industries, while German offshore wind is presented by companies that worked mostly onshore.

### BSH standards as a component of national industry strategy

As mentioned before, the main reason behind the development of the BSH standards was to ensure more project security. Although the representatives of case companies do not consider the standards as very challenging or hindering them from operating Germany, they mentioned a broader use of onshore practices in German offshore wind. As also mentioned before, this might be explained by the fact that the most companies operating in German offshore wind today came there from the onshore wind sector. Responding to their needs and taking into account their practices, the BSH standards serve as a tool to ensure German offshore wind development and can be seen as a part of industry strategy.

Assuming that cooperation with local companies might ease the establishment of the operations in Germany, as mentioned by OWEC Tower's representative, it can be stated that the BSH standards still do not construe a barrier to trade. Higher financial risks and subsidies in offshore wind (Steen&Hansen, 2013, p.2044) play an important role in the amount of resources possessed by the company: "... in oil and gas companies lead the standards, they have more money, and safety is very important for them" (OWEC's representative); "Most of the actors in oil and gas are relatively robust companies. And you have actors in offshore wind. Many pension funds that... invest in green energy. [And additionally] there are many speculators" (Kværner Verdal's representative). Availability of resources and lower profits in offshore wind lead to increasing role of state in offshore wind standardisation: in case with the BSH standards, the BSH tried to fulfil the expectations of the maritime industry and bring more stability into the growing sector. The need for an established system of rules to assess the opportunities in a specific market was also mentioned by the OWEC representative: "... we need some frame, political frame to be able to proceed and that's what we see starting in these countries". In this regard, nevertheless, it has to be kept in mind that immature industries usually do not have an established framework (Metcalf and Miles, 1994, p.250). Therefore, standards here can be seen as state industry strategical measure suggested by the GPN approach (Dicken, 2011, p.185). Intended to develop the industry and help the maturing thereof, standards would provide more certainty and this in its turn would attract both domestic and foreign investors. Trade and industry regulatory framework, therefore, is not



important only for the domestic actors, but also for the foreign companies when they choose a country of operation.

### Companies requirements as a governance strategy

In addition to the BSH standards, the companies at stake had to deal with clients' special requirements. Unfortunately, it was difficult to get detailed information on the type of the requirements, since the contracts usually include confidentiality clause. With a reservation of not being a lawyer, representative of one of the case companies mentioned use of onshore experience as a basis for the requirements by one of the clients:

A couple of things that had big impact in Alpha Ventus: one client was used to work with onshore projects. They had limited experience with offshore with anything relating to risks (weather, disruptions caused by weather, these things take more time [to be taken into consideration]). ...They did not have any established contract forms that reflected risks and time courses that are typical for an offshore project. They [client] used more land-based law in this regard. Different experiences at different sides of the table, different expectations and different approaches.

Here we see an example of a lead firm being able to control its suppliers through the contract form choice as well. For a supplier that does not have a unique product or sufficient bargaining power, it would be difficult to enforce its will, since a lead firm can easily change between the suppliers due to low costs and easy codification of its requirements (Gereffi&Fernandez-Stark, 2011, p.9). In this regard, the client's requirements could be seen as their governance strategy and their effort to improve the quality of the value chain. At the same time, the informants did not provide much information on the relation with the client. It is unknown, therefore, whether the clients could be classified as lead firms. Additionally, few or no examples were provided concerning the requirements set by the clients. It is, therefore, difficult to understand whether these requirements were set by the company to exercise the control over supplier or whether the client had to add such requirements due to the necessity to comply with a commonly established procedure. In the last case, that would be one more proof of the dependency of the clients on the institutional context as well. Nevertheless, without the needed information on the type of requirements, it is difficult to make conclusions on what actually happened, and the potential scenarios can be only supposed.

Additionally, some clients' requirements might originate from the governmental requirements. As it was mentioned previously, responsibility sharing is very important in case of any unexpected changes. A general perception of the representatives of the case companies

is that supplier has to take more responsibility in offshore wind than in offshore oil and gas. Used to offshore oil and gas practices, small Norwegian actors, therefore, have to take more risk.

Nevertheless, lead firms still can govern the value chain, even when certain standards have already been developed by the state institutions: "...in some cases the companies prepare tender processes, where they go out to make it known that they want to get offers. In other cases it is more based on selection of companies they would like to use, and invite specific companies to make an offer on the project" (representative of one of the Norwegian case companies). The lead firms' potential to choose between open and closed forms of tendering process is one example of their control over the access to value chain.

"The reason for this [closed tendering process] is less work with the tender process and less noise during the process. If you have a closed process, where you invite some few suppliers whom you know well, you may to a greater extent develop the project together with these suppliers" (representative of one of the Norwegian case companies). Here we can see that lead firms/clients choose specific companies and organise a tender among them. Such choice being based on either suppliers specific qualifications and reputation or their previous cooperation, can be considered as a relational governance form from the GVC perspective. Reputation is important in this case, since it influences the level of trust between the client and the supplier.

Representative of one of the Norwegian case companies also mentions a difference between an open and a closed forms of tendering process:

And you do not need to prepare the same amount of information in advance [for the closed tendering process]. Much of the information that the customer would have had to prepare itself, can instead be developed by the supplier. If the supplier develops the information, the supplier can develop something which is more adapted to the supplier's working methods, and through this save costs.

While client requires what is needed and therefore influences the supplier, the supplier in the closed tendering process has an ability to use the unique characteristics of their certain product as an advantage. In this particular example, we see that cooperation possibilities are present and supplier also has a say in the development process. Nevertheless, such relation has to be based on trust (Gereffi-Fernandez, 2011, p.9).

The same informant mentions that "If you choose an open tender process, you need to have prepared much work on your own in advance, in order for all the bidders to get the same information". The requirements set in an open tendering process has to be made available in

advance. Standards (company requirements), nonetheless, can barely be changed at this stage. Since the supplier will have the full responsibility for the development of the product in accordance with customer's requirements and no specific skills are required, as in relational governance structure, more suppliers would be able to participate in the competition. Specifications developed by the supplier in this case indicate the modular governance presented by the GVC approach.

“...if you have a more open tender process, you have a more competitive approach, where you set the bidders up against each other. They will have to deliver the best possible offer in order to get the job” (representative of one of the Norwegian case companies). Price can be a part of the “best offer” that supplier has to deliver. One could suppose that we deal with market governance then, where price is decisive (Gereffi-Fernandez, 2011, p.9). Nevertheless, price would be only one component of the offer. The others might be time, common research possibilities, improvement possibilities etc. Additionally, market governance structure suggests that buyer has a minimal input (Gereffi-Fernandez, 2011, p.9), while open tendering process for offshore wind products requires long and detailed preparatory work from the buyer/lead firm/client in advance. Therefore, again, the buyer's specifications in this case can be seen as a modular governance structure.

Being able to influence the access to the value chain through the form of tendering process, buyers can also influence the supplier's products at later stages. While open tendering process is based on the client's specifications to bigger extent, suppliers in closed tendering process can develop product characteristics together with the client.

Companies' requirements for the tendering process play a role of standards, since they contain “technical characteristics/specifications”. Sometimes lead firms might include compliance with specific standards into their requirements as well. Even if the process is open, the requirements might be developed to suit a certain supplier. And it is even easier to control the value chain through the closed tendering process. While in first case (open tendering process), price and other proposal's features are decisive, relations matter a lot in a closed tendering process. There is also a potential for cutting costs in both cases: while in open tendering process price influences the final decision of the client with regard to its choice of supplier, it can also promote competition between the suppliers and drive the production costs down. As to the closed tendering process, there are costs cutting possibilities mostly for the supplier who has more influence on the products design and characteristics.

## Experiences of the case companies in German offshore wind

Overall, it can be concluded that Norwegian companies operating in German offshore wind had to comply both with state regulations and client requirements. While the BSH standards developed as a response to the need expressed by the German maritime industry representatives, different actors contributed to their development. Namely, domestic companies and domestic and global standardization bodies. Additionally, German clients sometimes suggested their own vision concerning, for example, contract forms. The BSH standards serving as an instrument to develop domestic industry were assessed by the representatives of the Norwegian case companies as using onshore experiences and practices as basis. Nevertheless, the standards at stake are claimed to refer to the offshore experience as well. The use of onshore basis for the standards, if present, can be explained by the historical development of offshore wind in Germany and diversification of mostly onshore firms into offshore. In this regard, it can be also concluded that development of national standards to certain extent relates to the country's industrial experience and historical background.

## Conclusion

This master thesis was written in an effort to find out how Norwegian companies from foundations-related segment of value chain deal with the standards when operating in German offshore wind market. Using GPN and GVC approaches as theoretical framework for the analysis, this paper also contributes to better understanding of how different kinds of standards function within these 2 related, yet different approaches. The main questions that this paper tried to shed some light on were the following: what standards do Norwegian companies from foundations-related segment of value chain deal with in German offshore wind market? How have these standards developed? How do they influence the activities of the chosen Norwegian companies?

## Main findings of the research

Under “standards” both public and private standards are understood (David and Greenstein, 1990). Offshore wind has a great potential to become competitive and profitable source of energy in Europe, since the costs reductions make the industry attractive for the investor.<sup>105</sup> Nevertheless, for many countries prospectives are characterised as uncertain.<sup>106</sup> Lack of commonly accepted standards is typical for immature stage of an industry, since progress in industry usually leads to standard creation (Metcalf and Miles, 1994, p.250). Norwegian companies had to deal both with German national standards set by the BSH and companies requirements. The theoretical chapter of this paper suggests 2 roles that state standards can play from the GPN’s perspective (Dicken, 2011). Namely, state standards can serve as a trade-related measure playing a role of a non-tariff barrier to trade (Dicken, 2011, p.182) or an industry strategy measure (Dicken, 2011, p.185). The BSH standards were developed as a response to the industry needs by a group of experts. Industry representatives together with domestic and global standardization and certification companies worked as experts during this process. Presence of a number of international experts and references to Eurocodes had to ensure that the developed standards drew on principles of free trade. It is unlikely, at least in theory, that the BSH standards could play a role of non-tariff barrier to trade. As to the practice, the instable standards framework did not prevent the case companies from entering the German offshore wind market. In this case, taking into account the

---

<sup>105</sup> Wind Europe (2016). Making transition work, p.20. Retrieved 24.04.2017 from <https://windeurope.org/wp-content/uploads/files/about-wind/reports/WindEurope-Making-transition-work.pdf>

<sup>106</sup> Ibid., p.9

instability of the sector and its early development stage, it can be concluded that the BSH standards were intended to play more a role of industry strategy component and help the industry's maturing without directly excluding foreign companies. This is significant for the understanding of the relation between the standards and industry's development stages. Metcalfe and Miles (1994) point out that standards are developed when the technical progress takes place, therefore, more standards are present in mature industries. Here we can see that standards might also help this maturing process. This is an example of regulatory role of state where state actually can influence the pace of the industry development. Additionally, it is important to mention that standards when intending to develop own industry do not necessarily aim at exclusion of foreign competitors. Nevertheless, they will also influence the foreign companies, and unintended exclusion is possible.

Norwegian companies assessed the standards in German OW projects as different from what they were used to typically from the offshore oil and gas sector. Use of onshore practices as a basis for the national standards can be explained by the fact that most local actors in German offshore wind today have their previous experiences from onshore (Fornahl et al., 2012, p.848). Having expressed the need for the standards and being related to as stakeholders, German domestic companies could also have influenced the shaping of BSH standards in a way that their experience and practices were taken into account. Being "unusual", the BSH standards did not construe a big difficulty for the Norwegian case companies. Their experience with standards during Alpha Ventus project would not hinder them from new activities in German market in future. Nevertheless, there were several challenges in German market, and one of them (general for offshore wind globally, though) was the responsibility sharing. The main question in this regard would be whether it pays off to adjust to new standards regime when the risks are too high.

Wider use of onshore practices was also noticed by the case companies in the relations with the clients and clients' requirements. At the end of the day, Norwegian companies had to agree on the clients' suggestions. GVC's approach used for the theoretical part of this paper sees private standards as a governance instrument used by the companies and relate to the modular mode of governance (Ponte&Gibbon, 2005; Gereffi&Fernandez-Stark, 2011). Here further research might be done with regard to the type of Norwegian actors and how their position within the value chain might be changed, if it's possible.

Although the case companies mentioned that the standards and client requirements had onshore experience as their basis and found it different from their own usual practices, the fact that they entered the contracts proves that they assessed them as manageable. While

some of the case companies found such standards challenging and connected their experience with them to their leave of German offshore wind market, they also mentioned a number of other challenges present in German offshore, for example, grid connection. In addition, responsibility sharing in offshore wind in general does not work in favour of small suppliers. The German offshore wind market is not an exception in this regard.

### Research limitations

The research done in this paper is limited by time and informants availability. It was necessary for the multiple case study to apply the replication logic, therefore, companies from the same segment of value chain had to be chosen. It resulted in choice of three companies that were active in the same project – Alpha Ventus – during the initial development and therefore immature phase of the German offshore wind industry. Ideally, more companies from other projects and stages of development that had to deal with the same standards should have been investigated as well. This was not possible due to time and economic constraints within the frame of a master project. Additionally, as mentioned in the methodology chapter, the attempt to get into contact with informants from cables segment of value chain did not succeed.

Another limitation consists in the access to the data. Firstly, only the last versions of the BSH standards are available online. Nevertheless, the access to the previous versions of the standards would only be necessary if decided to continue research (see Suggestions for further research). At the same time, limited access to data was experienced when working on this paper. The informants did not share much information concerning their relations with the clients' representatives. The difficulties in access to such information can be explained by its sensitive character and contractual obligations of the parties. Although the informants mentioned interesting facts, later, at the confirmation stages, they revoked some of the statements. Because of the ethical obligations, no more details can be provided at this point.

### Suggestions for further research

As mentioned in the limitations part, the initial idea to compare the experiences of Norwegian companies at different stages of industry development, was difficult to perform. The reason for that was mostly the access to the informants. Nevertheless, it would be interesting to compare experiences of a foreign company after the standards were updated. Comparing the experience of the same company before and after the changes happened would help to see what implications such changes of national standards have on the foreign companies. Another aspect that could be researched further relates to the companies

requirements. Here it would be interesting to find, if possible, examples of Norwegian companies that worked with different clients in Germany and what this means for their eventual role as a supplier complying with the standard. Client-supplier relationship is also interesting to consider from the relational point of view when reputation and previous cooperation play decisive role in sustaining and deepening it further (Gereffi&Fernandez-Stark, 2011). This eventually might also be a topic for further investigations.

It seemed also interesting that the representatives of all 3 cases companies perceived that onshore experience was used more in Germany than in, for example, the UK. This relates both to the BSH standards and clients requirements. At the same time, the BSH standards are claimed to refer to a number of standards developed by global standardisation bodies and include those regulating offshore oil and gas activities. In this regard, it would be interesting to compare the BSH standards to the ones usually used by Norwegian companies when operating in offshore oil and gas sector. Here the same case companies could be considered. This paper did not concentrate on this aspect due to the time limitations of master thesis. Having 3 main BSH standards with several updates to each of them and at least 4 international documents that influenced them, it would require more time to provide a detailed comparative analysis. Applying the same argument of wider use of onshore practices in client-supplier relations, it would be interesting to compare the clients' requirements in the German offshore wind sector and clients' requirements, for example, in the British OW sector. This interest can be explained by the claim of one of the informants that the UK "has the same history as Norway" when it comes to the offshore experiences.

### Theoretical contribution of the paper

First of all, the analytical part of this paper was based on the combination of concepts from 2 related, yet differentiated approaches, namely, GPN and GVC. Bringing together standards as regulatory power tool of the states and private standards as companies governance mode, demonstrates how close GPN and GVC approaches are. The reason is that state standards can be covered by the institutional context of the GVC approach, while private standards can be seen as a company strategy in a contested arena in GPN where all the actors switch between competition and collaboration.

Secondly, this paper uses actively the idea of standards development in parallel to industry maturing (Metcalf and Miles, 1994). This idea emphasizes that more progress in the field would eventually lead to the standards creation. At the same time, it seems difficult to suggest innovative solutions within the areas already covered by standards and, therefore,



change existing practices. Nevertheless, possibilities for standards changes/updates and creation of new standards are necessary to capture new developments and broaden the scope of the standards including new aspects.

Although, it has been stated many times that participation in standardisation processes brings certain advantages for the participants,<sup>107</sup> this paper has demonstrated it once more. The use of specific practices in national standards development can be explained by the origin of the actors in that industry. When diversifying their activities, companies tend to bring their previous practices to new industries and adapt them to new reality. Intended to help the maturing of industry, standards take into account opinions and practices of the domestic representatives of that industry and try to cover their needs. Therefore, national standards influenced by the industrial history and development of a particular country can require a new approach from the companies used to different practices. In this regard, national standards and practices used as their basis have to be taken into account when assessing the new possibilities abroad.

Overall, this paper has shown how 3 particular Norwegian companies that contributed to the foundations segment of German offshore wind value chain experienced working with national standards and clients requirements during the immature phase of industry development. Here it has to be emphasised that the paper had a goal of contributing at more analytical level. While an initial idea suggested that standards, whether national or private, can limit the access to the value chain, the findings show that the effect thereof depends on a number of additional factors. Among them: differences between industrial development of company's country of origin and company's operation country, and previous company's experiences can be mentioned.

---

<sup>107</sup> CENELEC (2013). Standards and your business. How your business can benefit from standards and participate in standardization activities. Retrieved 24.04.2017 from [https://www.cencenelec.eu/News/Publications/Publications/Standards-and-your-business\\_2013-09.pdf](https://www.cencenelec.eu/News/Publications/Publications/Standards-and-your-business_2013-09.pdf)



## References

- 4C Offshore (2017). Events on Alpha Ventus. Retrieved 14.03.2017 from <http://www.4coffshore.com/windfarms/project-dates-for-alpha-ventus-de01.html>
- 4C Offshore (2017). Events on Breitling. Retrieved 14.03.2017 from <http://www.4coffshore.com/windfarms/project-dates-for-breitling-de42.html>
- 4C Offshore (2017). Events on Hooksiel. Retrieved 14.03.2017 from <http://www.4coffshore.com/windfarms/project-dates-for-hooksiel-de76.html>
- 4C Offshore (2017). Organizations working on Alpha Ventus. Retrieved 16.03.2017 from <http://www.4coffshore.com/windfarms/contracts-on-alpha-ventus-de01.html>
- 4C Offshore (2017). Organizations working on Amrumbank West. Retrieved 17.03.2017 from <http://www.4coffshore.com/windfarms/contracts-on-amrumbank-west-de05.html>
- 4C Offshore (2017). Organizations working on Bard Offshore 1. Retrieved 16.03.2017 from <http://www.4coffshore.com/windfarms/contracts-on-bard-offshore-1-de23.html>
- 4C Offshore (2017). Organizations working on Borkum Riffgrund 1. Retrieved 17.03.2017 from <http://www.4coffshore.com/windfarms/contracts-on-borkum-riffgrund-1-de04.html>
- 4C Offshore (2017). Organizations working on Dantysk. Retrieved 17.03.2017 from <http://www.4coffshore.com/windfarms/contracts-on-dantysk-de02.html>
- 4C Offshore (2017). Organizations working on EnBW Baltic 1. Retrieved 28.03.2017 from <http://www.4coffshore.com/windfarms/contracts-on-enbw-baltic-1-de78.html>
- 4C Offshore (2017). Organizations working on EnBW Baltic 2. Retrieved 28.03.2017 from <http://www.4coffshore.com/windfarms/contracts-on-enbw-baltic-2-de52.html>
- 4C Offshore (2017). Organizations working on Meerwind Süd/Ost. Retrieved 19.03.2017 from <http://www.4coffshore.com/windfarms/contracts-on-meerwind-s%c3%bcd-ost-de07.html>
- 4C Offshore (2017). Organizations working on Riffgat. Retrieved 17.03.2017 from <http://www.4coffshore.com/windfarms/contracts-on-riffgat-de21.html>
- 4C Offshore (2017). Organizations working on Nordsee Ost. Retrieved 17.03.2017 from <http://www.4coffshore.com/windfarms/contracts-on-nordsee-ost-de06.html>
- 4C Offshore (2017). Organizations working on Trianel Windpark Borkum 1. Retrieved 28.03.2017 from <http://www.4coffshore.com/windfarms/contracts-on-trianel-windpark-borkum-i-de27.html>
- 4C Offshore (2017). Vessels working on Amrumbank West. Retrieved 17.03.2017 from <http://www.4coffshore.com/windfarms/vessels-on-amrumbank-west-de05.html>

<sup>1</sup> 4C Offshore (2017). Vessels working on Bard Offshore 1. Retrieved 16.03.2017 from <http://www.4coffshore.com/windfarms/Amsterdam---MEO-/vessels-on-bard-offshore-1-de23.html>

4C Offshore (2017). Vessels working on Dantysk. Retrieved 17.03.2017 from <http://www.4coffshore.com/windfarms/vessels-on-dantysk-de02.html>

4C Offshore (2017). Vessels working on EnBW Baltic 2. Retrieved 28.03.2017 from <http://www.4coffshore.com/windfarms/vessels-on-enbw-baltic-2-de52.html>

4C Offshore (2017). Vessels working on Meerwind Süd/Ost. Retrieved 19.03.2017 from <http://www.4coffshore.com/windfarms/vessels-on-meerwind-s%c3%bcd-ost-de07.html>

4C Offshore (2017). Vessels working on Nordsee Ost. Retrieved 17.03.2017 from <http://www.4coffshore.com/windfarms/vessels-on-nordsee-ost-de06.html>

4C Offshore (2017). Vessels working on Riffgat. Retrieved 17.03.2017 from <http://www.4coffshore.com/windfarms/vessels-on-riffgat-de21.html>

4C Offshore (2017). Vessels working on Sandbank. Retrieved 20.03.2017 from <http://www.4coffshore.com/windfarms/vessels-on-sandbank-de12.html>

4C Offshore (2017). Who We Are? Retrieved 7.05.2017 from <http://www.4coffshore.com/windfarms/about-us.aspx>

Adrian, M. (2014). The Spatiality of Standard Evolution – Standardization and Certification in the Wind Industry from the Spatial View, paper presented at the DRUID Academy Conference, Aalborg, 21-23-01.2015.

Almeida, R. (2012). DNV and GL Group announce landmark merger. Retrieved 30.04.2017 from <http://gcaptain.com/group-announce-landmark-merger/>

Andrae, A., Argyriadis, K., Dalhoff, P., Nath, C. and Schwartz, S. (2009). Standards and Certification. In Twidell, J. and Gaudiosi, G. (Eds). *Offshore Wind Power*. Essex: Multi-Science Publishing Co.Ltd, pp.225-269.

Beuth Publishing DIN (2017). DIN EN ISO 19901-6: 2012-03. Retrieved 23.04.2017 from <https://www.beuth.de/en/standard/din-en-iso-19901-6/149667376>

Blind, K. and Mangelsdorf, A. (2016). Motives to standardize: Empirical evidence from Germany. *Technovation* 48-49, pp.13-24.

Brun, L.C. and Lee, J. (In work). The Role of the State in Global Value Chains.

Bryman, A. (2012). *Social Research Methods*, 4th edition, Oxford: Oxford University Press.

Bundesamt für Seeschifffahrt und Hydrographie (2007). Standard Design of Offshore Wind Turbines. Retrieved 21.03.2017 from <http://www.bsh.de/en/Products/Books/Standard/7005eng.pdf>

Bundesamt für Seeschifffahrt und Hydrographie (2007). Standard Investigation of the Impacts of Offshore Wind Turbines on the Marine Environment (StUK3). Retrieved 21.03.2017 from [http://www.bsh.de/en/Products/Books/Other\\_publications/Stuk-eng.pdf](http://www.bsh.de/en/Products/Books/Other_publications/Stuk-eng.pdf)

Bundesamt für Seeschifffahrt und Hydrographie (2014). Standard Ground Investigations. Retrieved 21.03.2017 from <http://www.bsh.de/en/Products/Books/Standard/7004eng.pdf>

Bundesamt für Seeschifffahrt und Hydrographie (2017). Plan approval procedure for the construction and operation of installations in the EEZ. Retrieved 20.03.2017 from [http://www.bsh.de/en/Marine\\_uses/Industry/Wind\\_farms/Approval\\_Procedure.jsp](http://www.bsh.de/en/Marine_uses/Industry/Wind_farms/Approval_Procedure.jsp)

CENELEC (2013). Standards and your business. How your business can benefit from standards and participate in standardization activities. Retrieved 24.04.2017 from [https://www.cenelec.eu/News/Publications/Publications/Standards-and-your-business\\_2013-09.pdf](https://www.cenelec.eu/News/Publications/Publications/Standards-and-your-business_2013-09.pdf)

Chaminade, C. and Liu, J. (2012). Commonalities, differences, and interplay between global production networks and global innovation networks in two multinational companies, paper presented at the DRUID Academy Conference, Copenhagen, 19-21.06.2012. Retrieved 7.05.2017 from [http://druid8.sit.aau.dk/acc\\_papers/3qulsrrq2lr0bgr2k86emdxdnkvs.pdf](http://druid8.sit.aau.dk/acc_papers/3qulsrrq2lr0bgr2k86emdxdnkvs.pdf)

Clean Energy Wire (2017). Offshore Wind Energy Development in Germany in 2016. Retrieved 14.03.2017 from <https://www.cleanenergywire.org/news/kickstarting-energiewende-transport-sector-offshore-wind-statistics/offshore-wind-energy-development-germany-2016>

Coe, N.M., Dicken, P. and Hess, M. (2008). Global production networks: realising the potential. *Journal of Economic Geography* 8, pp.271-295.

Conference of the Representatives of the Governments of the Member States (2007). Consolidated version of the Treaty on the Functioning of the European Union. Retrieved 7.05.2017 from <http://www.refworld.org/docid/4b17a07e2.html>

David, P.A. and Greenstein, S. (1990). The economics of compatibility standards: an introduction to recent research. *Economics of Innovation and New Technology* 1, pp.3-41.

Dicken, P. (2011). *The Global Shift*, 6<sup>th</sup> edition, New York: The Guilford Press.

Die Bundeskanzlerin Merkel (2011). Pressestatements von Bundeskanzlerin Angela Merkel und Bundesaußenminister Guido Westerwelle zu den Folgen der Naturkatastrophen in Japan sowie den Auswirkungen auf die deutschen Kernkraftwerke. Retrieved 15.03.2017 from <https://www.bundeskanzlerin.de/ContentArchiv/DE/Archiv17/Mitschrift/Pressekonferenzen/2011/03/2011-03-14-bkin-lage-japan-atomkraftwerke.html>

DIN German Institute for Standardization (2013). The German Standardization Strategy: an update. Retrieved 20.03.2017 from [http://www.iso.org/sites/PEG/docs/PEG%20Documents/08\\_DNS\\_2010e\\_akt.pdf](http://www.iso.org/sites/PEG/docs/PEG%20Documents/08_DNS_2010e_akt.pdf)

DIN German Institute for Standardization (2017). A brief introduction to standards. Retrieved 23.04.2017 from <http://www.din.de/en/about-standards/a-brief-introduction-to-standards>

DIN German Institute for Standardization (2017). Benefits for the public sector. Retrieved 23.04.2017 from <http://www.din.de/en/about-standards/benefits-for-the-public-sector>

DIN German Institute for Standardization (2017). Contract between the Federal Republic of Germany and DIN German Standards Institution. Retrieved 23.04.2017 from <http://www.din.de/blob/79650/76ad884fb2c4dd6aa5b900e7a1574da6/contract-din-and-brd-data.pdf>

DIN German Institute for Standardization (2017). DIN and international standardization. Retrieved 30.04.2017 from <http://www.din.de/en/din-and-our-partners/din-and-international-standardization>

DIN German Institute for Standardization (2017). DIN e.V. Retrieved 23.04.2017 from <http://www.din.de/en/din-and-our-partners/din-e-v>

DIN German Institute for Standardization (2017). Global trade. Retrieved 23.04.2017 from <http://www.din.de/en/about-standards/benefits-for-the-private-sector/global-trade>

DIN German Institute for Standardization (2017). Promoting innovation. Retrieved 23.04.2017 from <http://www.din.de/en/about-standards/benefits-for-the-private-sector/promoting-innovation>

DIN German Institute for Standardization (2017). SME Commission (KOMMIT). Retrieved 23.04.2017 from <http://www.din.de/en/about-standards/benefits-for-the-private-sector/sme-commission-kommit>

DIN German Institute for Standardization (2015). Statutes. Retrieved 23.04.2017 from <http://www.din.de/blob/66170/0ad27759be047557cf7654e1f4df824d/din-satzung-en-data.pdf>

DIN German Institute for Standardization (2017). Using standards brings costs savings. Retrieved 23.04.2017 from <http://www.din.de/en/about-standards/benefits-for-the-private-sector/cost-savings>

DNV (2014). Design of Offshore Wind Turbine Structures. Retrieved 24.04.2017 from <https://rules.dnvgl.com/docs/pdf/DNV/codes/docs/2014-05/Os-J101.pdf>

DNV (2014). Summary of changes. Retrieved 24.04.2017 from <http://rules.dnvgl.com/docs/pdf/DNV/codes/docs/2014-11/Main-changes.pdf>

DNV GL (2016). DNV GL in brief. Retrieved 24.04.2017 from <https://www.dnvgl.com/about/index.html>

DNV GL (2016). Our history. Retrieved 24.04.2017 from <https://www.dnvgl.com/about/in-brief/our-history.html>

DNV GL (2017). DNV GL. Retrieved 30.04.2017 from <https://www.dnvgl.no/>

Ernst&Young (2015). Offshore wind in Europe: Walking the tightrope to success. Retrieved from 24.04.2017 from <http://www.ewea.org/fileadmin/files/library/publications/reports/EY-Offshore-Wind-in-Europe.pdf>

Export.gov. (2017). Market Research on Germany: Country Commercial Guide. Trade Regulations, Customs and Standards. Retrieved 21.03.2017 from <http://2016.export.gov/germany/marketresearchongermany/countrycommercialguide/traderegulationsandstandards/index.asp>

Federal Ministry of Economics and Energy (2015). Fact-Sheet Alpha Ventus. Retrieved 20.04.2017 from [https://www.alpha-ventus.de/fileadmin/Dateien/publikationen/av\\_Factsheet\\_Engl\\_2016.pdf](https://www.alpha-ventus.de/fileadmin/Dateien/publikationen/av_Factsheet_Engl_2016.pdf)

Federal Ministry of Economics and Technology and Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (2010). Energy Concept for environmentally sound, reliable and affordable energy supply. Retrieved 14.03.2017 from <http://www.bmwi.de/English/Redaktion/Pdf/energy-concept,property=pdf,bereich=bmwi,sprache=en,rwb=true.pdf>

Fold, N. (2002). Lead Firms and Competition in “Bi-Polar” Commodity Chains: Grinders and Branders in the Global Cocoa-Chocolate Industry. *Journal of Agrarian Change* 2 (2), pp.228-247.

Fornahl, D., Hassink, R., Klaering, C., Mossig, I. and Schröder, H. (2012). From the Old Path of Shipbuilding onto the New Path of Offshore Wind Energy? The Case of Northern Germany. *European Planning Studies* 20 (5), pp.835-855.

Fraunhofer Institute for Wind Energy and System Technology IWES (2015). Wind Energy Report Germany 2014. Retrieved 14.03.2017 from [http://publica.fraunhofer.de/eprints/urn\\_nbn\\_de\\_0011-n-354656-16.pdf](http://publica.fraunhofer.de/eprints/urn_nbn_de_0011-n-354656-16.pdf)

Fraunhofer Institute for Wind Energy and System Technology IWES (2013). Windenergie Report Deutschland 2012. Retrieved 14.03.2017 from [http://publica.fraunhofer.de/eprints/urn\\_nbn\\_de\\_0011-n-2385784.pdf](http://publica.fraunhofer.de/eprints/urn_nbn_de_0011-n-2385784.pdf)

Fraunhofer Institute for Wind Energy and System Technology IWES (no year). The importance of wind energy in the energy sector and for the German Energiewende. Retrieved 14.03.2017 from [http://www.offshore-stiftung.de/sites/offshorelink.de/files/documents/SOW\\_Download\\_FraunhoferIWES\\_OffshoreStudy\\_ExecutiveSummary.pdf](http://www.offshore-stiftung.de/sites/offshorelink.de/files/documents/SOW_Download_FraunhoferIWES_OffshoreStudy_ExecutiveSummary.pdf)

Fred.Olsen Windcarrier (2017). Track Record. Retrieved 22.03.2017 from <http://windcarrier.com/track-record/#project-map>

Gao, P., Yu, J. and Lyytinen, K. (2013). Government in standardization in the catching-up context: Case of China’s mobile system. *Telecommunications Policy* 8, pp.200-209.

Gereffi, G. (1994). The Organization of Buyer-Driven Global Commodity Chains: How U.S. Retailers Shape Overseas Production Networks. In Gereffi, G. and Korzeniewicz, M. (Eds). *Commodity Chains and Global Capitalism*. Westport: Praeger Publishers.

Gereffi, G., Humphrey, J., Kaplinsky, R. and Sturgeon, T.J. (2001). Introduction: Globalisation, Value Chains and Development. *IDS Bulletin* 32 (3), pp.1-8.

Gereffi, G. and Fernandez-Stark, K. (2011). *Global Value Chain Analysis: A Primer*. Durham: Center on Globalization, Governance and Competitiveness.

German Wind Energy Association (2016). Offshore wind energy in Germany: Figures 2015 – Record achieved due to catch-up effect. Retrieved 14.03.2017 from <https://www.wind-energie.de/en/press/press-releases/2016/offshore-wind-energy-germany-figures-2015-record-achieved-due-catch>

Germany Trade&Invest (2016). Wind Industry. A sustainable business in a stable investment environment. Retrieved 24.04.2017 from <http://www.gtai.de/GTAI/Navigation/EN/Invest/Industries/Energy/wind.html>

Gibbon, P. (2008). Governance, Entry Barriers, Upgrading: A Re-Interpretation of Some GVC Concepts from the Experience of African Clothing Exports. *Competition&Change* 12 (1), pp.29-48.

Global Wind Energy Council (2016). Expansion of offshore wind energy in Germany in the first half of 2016. Retrieved 14.03.2017 from <http://www.gwec.net/expansion-of-offshore-wind-energy-in-germany-in-the-first-half-of-2016/>

Global Wind Energy Council (2016). The Global Wind Energy Outlook 2016. Retrieved 14.03.2017 from <http://files.gwec.net/files/GlobalWindEnergyOutlook2016>

Hay, I. (2010). *Qualitative Research Methods in Human Geography*, 3d edition, Oxford: Oxford University Press.

Henderson, J., Dicken, P., Hess, M., Coe, N. and Yeung, H.W.-C. (2002). Global production networks and the analysis of the economic development. *Review of International Political Economy* 9 (3), pp.436-464.

Hess, M. and Coe, N.M. (2005). Making connections: global production networks, standards, and embeddedness in the mobile-telecommunications industry. *Environment and Planning A* 38, pp.1205-1227.

International Centre for Trade and Sustainable Development (2008). TRIMs and Local Content. Retrieved 20.04.2017 from <http://www.ictsd.org/bridges-news/bridges/news/trims-local-content>

Intpow&Innovation Norway (2011). Offshore Wind Germany. Market study 2011. Retrieved 24.04.2017 from [http://www.regionbergen.no/publish\\_files/intpow\\_pdf\\_germanoffshorewind\\_2.pdf](http://www.regionbergen.no/publish_files/intpow_pdf_germanoffshorewind_2.pdf)

Karlsen, A. (2016). Life after oil: Norwegian offshore wind capabilities. Retrieved 24.04.2017 from <https://blogg.svt.ntnu.no/life-after-oil-norwegian-offshore-wind-capabilities/>



Lapan, S.D., Quartaroli, M.T. and Riemer, F.J. (2011). *Qualitative Research: An Introduction to Methods and Design*. Hoboken: Wiley.

Lee, J. (2010). Global Commodity Chains and Global Value Chains. In Denmark, R.A. (Ed). *The International Studies Encyclopedia*. Oxford: Wiley-Blackwell, pp.2987-3006.

Lloyd's Register (2016). Lloyd's Register – improving safety, quality and performance. Retrieved 24.04.2017 from <http://www.lr.org/en/>

Lloyd's Register (2016). Rules and Regulations. Retrieved 24.04.2017 from <http://www.lr.org/en/RulesandRegulations/>

Lorc Knowledge (2011). EMS Emden Offshore Windfarm. Retrieved 14.03.2017 from <http://www.lorc.dk/offshore-wind-farms-map/ems-emden?free=ems>

Menzel, M.-P. and Grillitsch, M. (2014). Divergent Spatialities and Interdependencies between the Evolution of Standards and Clusters, paper presented at the Workshop on “Cluster Life Cycles”, Kiel, 15-16.09.2014.

Metcalf, J.S. and Miles, I. (1994). Standards, selection and variety: an evolutionary approach. *Information Economics and Policy* 6, pp.243-268.

Mohsin, S. and Holter, M. (2016). Norway declares crisis in oil industry as devaluation continues. Bloomberg. Retrieved 22.03.2017 from <https://www.bloomberg.com/news/articles/2016-01-14/norway-government-rules-out-extra-stimulus-as-oil-rout-persists>

Nadvi, K. (2008). Global standards, global governance and the organization of global value chains. *Journal of Economic Geography* 8, pp.323-343.

Naerings- og fiskeridepartementet (2004). Lov om konkurranse mellom foretak og kontroll med foretakssammenslutninger (konkurranseloven). Retrieved 7.05.2017 from [https://lovdata.no/dokument/NL/lov/2004-03-05-12/KAPITTEL\\_3#KAPITTEL\\_3](https://lovdata.no/dokument/NL/lov/2004-03-05-12/KAPITTEL_3#KAPITTEL_3)

Norwegian Energy Partners (2017). About. Retrieved 27.04.2017 from <http://www.norwep.com/About>

Norwegian Energy Partners (2017). What was Intpow? Retrieved 27.04.2017 from <http://www.norwep.com/About/What-was-INTPOW>

OWEC Tower AS (2013). Company. Retrieved 30.04.2017 from <http://www.owectower.no/company/>

Ponte, S. and Gibbon, P. (2005). Quality standards, conventions and the governance of global value chains. *Economy and Society* 34 (1), pp.1-31.

Ponte, S. and Sturgeon, T. (2014). Explaining governance in global value chains: A modular theory-building effort. *Review of International Political Economy* 21 (1), pp. 195-223.

Prall, U. (2009). Legal frame for the use of offshore wind energy in Germany, background paper presented at the 3<sup>rd</sup> Seminar on EIA “Which kind of legal frame we need?”, Riga, 15-16.04.2009.

Presse- und Informationsamt der Bundesregierung (2016). Förderung steuern, Kosten senken. Retrieved 14.03.2017 from

<https://www.bundesregierung.de/Content/DE/Artikel/2016/06/2016-06-08-eeg-novelle.html>

Rothbauer, P.M. (2008). Triangulation. In Given, L.M (Ed). *The SAGE Encyclopedia of Qualitative Research Methods*. The USA: SAGE Publications Inc., pp.892-894.

SGS (2017). SGS in brief. Retrieved 24.04.2017 from <http://www.sgs.com/en/our-company/about-sgs/sgs-in-brief>

Siem Offshore (2017). Siem Offshore Contractors awarded W2W Vessel Charter Contract. Retrieved 16.03.2017 from

<http://www.siemoffshore.com/Default.aspx?ID=14&Action=1&NewsId=713&M=NewsV2&PID=308>

Siemens (2012). One year after Fukushima – Germany’s path to a new energy policy.

Retrieved 15.03.2017 from

<http://www.siemens.com/press/pool/de/feature/2012/corporate/2012-03-energiewende/factsheet-e.pdf>

SINTEF (2016). Internationalization of Norwegian Offshore Wind Industry. Retrieved 14.03.2017 from <https://www.sintef.no/en/projects/internationalization-of-norwegian-offshore-wind-in/>

Steen, M. and Hansen, G.H. (2013). Same sea, different ponds: Cross-sectorial knowledge spillovers in the North Sea. *European Planning Studies* 22 (10), pp.2030-2049.

Stiftung Offshore Windenergie (2017). Offshore-Windenergie: Ausbau schreitet nun kontinuierlich voran– Bundesregierung bremst weitere Dynamik. Retrieved 15.03.2017 from <http://www.offshore-stiftung.de/offshore-windenergie-ausbau-schreitet-nun-kontinuierlich-voran-%E2%80%93-bundesregierung-bremst-weitere>

Stiftung Offshore-Windenergie (2017). Sauberer Strom vom Meer. Retrieved 14.03.2017 from <http://www.offshore-stiftung.de/offshore-windenergie>

The European Parliament and the Council (2015). Directive (EU) 2015/1535 laying down a procedure for the provision of information in the field of technical regulations and of rules on Information Society services. Retrieved 7.05.2017 from <http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32015L1535&from=EN>

Utterback, J.M. (1994). *Mastering the dynamics of innovation: How companies can seize opportunities in the face of technological change*. The USA: Harvard Business School Press.

Warner, M. (2011). *Local content in procurement: creating local jobs and competitive domestic industries in supply chains*. Sheffield: Greenleaf Publishing.

Wilson, J.S. (2012). Standards and Technical Barriers to Trade: Prospects for Country-Level Reform, The World Bank. Retrieved 7.05.2017 from [http://siteresources.worldbank.org/INTTRADERESESEARCH/Resources/544824-1320091873839/8238146-1340132024998/TradeCostsandFacilitation\\_Brief\\_TBTGoods\\_08\\_08.pdf](http://siteresources.worldbank.org/INTTRADERESESEARCH/Resources/544824-1320091873839/8238146-1340132024998/TradeCostsandFacilitation_Brief_TBTGoods_08_08.pdf)

Wind Power Monthly (2012). The ongoing effort to globalise standards. Retrieved 15.03.2017 from <http://www.windpowermonthly.com/article/1114328/ongoing-effort-globalise-standards>

WindEurope (2016). Germany EEG reform a mixed bag for wind energy. Retrieved 15.03.2017 from <https://windeurope.org/newsroom/press-releases/germany-eeg-reform-a-mixed-bag-for-wind-energy/>

Wind Europe (2016). Making transition work. Retrieved 24.04.2017 from <https://windeurope.org/wp-content/uploads/files/about-wind/reports/WindEurope-Making-transition-work.pdf>

Woebekking, M. (2008). IEC TS 61400-22. The new standard for Wind Turbines and Wind Farms - Onshore and Offshore, GL. Retrieved 7.05.2017 from <http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.698.2263&rep=rep1&type=pdf>

World Trade Organization (1994). Agreement on Technical Barriers to Trade. Retrieved 7.05.2017 from [https://www.wto.org/english/docs\\_e/legal\\_e/17-tbt.pdf](https://www.wto.org/english/docs_e/legal_e/17-tbt.pdf)

Wuestenhagen, R. and Bilharz, M. (2006). Green energy market development in Germany: effective public policy and emerging customer demand. *Energy Policy* 34, pp.1681-1696.

Xie, Z., Hall, J., McCarthy, I.P., Skitmore, M. and Shen, L. (2015). Standardization efforts: The relationship between knowledge dimensions, search processes and innovation outcomes. *Technovation* 48-49, pp. 69-78.

Yeung, H.W-C. and Coe, N.M. Toward a Dynamic Theory of Global Production Networks. *Economic Geography* 91 (1), pp.29-58.

Yin, R.K. (2014). *Case Study Research. Design and Methods*, 5<sup>th</sup> edition, the USA: SAGE Publications Inc.



Annex I. Norwegian Companies in German Offshore Wind Projects.

Project	Year	Capacity	Company	Service/Product
Alpha Ventus	2010	60 MW	OWEC Tower AS	Completed detailed design of 6 OWEC Quattropod foundations <sup>108</sup>
			Norwind	Was responsible for engineering, construction, assembly and installation of jacket foundations <sup>109</sup>
			Aker Verdal AS	Was responsible for supply of 6 tripod foundations and piles <sup>110</sup>
			Oceanteam ASA	Was assigned installation of 66km of export cable <sup>111</sup>
			StormGeo AS	Involved as a consultant to provide daily weather and wave conditions forecasts <sup>112</sup>
			VisSim AS	Supplied vessel traffic management and surveillance systems <sup>113</sup>
EnBW Baltic 1	2011	48.3 MW	StormGeo AS	Metocean forecasting and warning services <sup>114</sup>
			ABB AS	Provided main components of the gas-insulated medium voltage switchgear with the full protection and control systems and the supply of subsistence system with transformer and battery system on the platform, also the electrical equipment for the offshore substation <sup>115</sup>
Bard Offshore 1	2013	400 MW	Siem Offshore AS	The company was awarded a contract to provide a vessel for service operations <sup>116</sup>
			StormGeo AS	Delivered daily weather and wave conditions forecasts via web portal and email <sup>117</sup>
			Statnett	Cable-laying vessels <sup>118</sup>

<sup>108</sup> 4C Offshore (2017). Organizations working on Alpha Ventus. Retrieved 16.03.2017 from <http://www.4coffshore.com/windfarms/contracts-on-alpha-ventus-de01.html>

<sup>109</sup> Ibid.

<sup>110</sup> Ibid.

<sup>111</sup> Ibid.

<sup>112</sup> Ibid.

<sup>113</sup> Ibid.

<sup>114</sup> 4C Offshore (2017). Organizations working on EnBW Baltic 1. Retrieved 28.03.2017 from <http://www.4coffshore.com/windfarms/contracts-on-enbw-baltic-1-de78.html>

<sup>115</sup> Ibid.

<sup>116</sup> Siem Offshore (2017). Siem Offshore Contractors awarded W2W Vessel Charter Contract. Retrieved 16.03.2017 from

<http://www.siemoffshore.com/Default.aspx?ID=14&Action=1&NewsId=713&M=NewsV2&PID=308>

<sup>117</sup> 4C Offshore (2017). Organizations working on Bard Offshore 1. Retrieved 16.03.2017 from <http://www.4coffshore.com/windfarms/contracts-on-bard-offshore-1-de23.html>

			Transport AS	
			Swire Seabed	Export cable installation vessel <sup>119</sup>
Riffgat	2014	108 MW	StormGeo AS	Delivered daily weather and wave conditions forecasts via web portal and email <sup>120</sup>
			Statnett Transport AS	Cable-laying vessels <sup>121</sup>
Meerwind Süd/Ost	2014	288 MW	StormGeo AS	Metocean forecasting and warning services <sup>122</sup>
			Solstad Offshore ASA	Cable installation vessel <sup>123</sup>
			GC Rieber Shipping ASA	Cable installation vessel
Amrumbank West	2015	302 MW	StormGeo AS	Delivered daily weather and wave conditions forecasts via web portal and email <sup>124</sup>
			Siem Offshore AS	Cable installation vessels <sup>125</sup>
			Olympic Shipping AS	Cable installation vessels <sup>126</sup>
DanTysk	2015	288 MW	StormGeo AS	Metocean forecasting and warning services <sup>127</sup>
			Parker Scanrope AS	Array cables, accessories and offshore services <sup>128</sup>
			Olympic Shipping AS	Installed array cables <sup>129</sup>
Nordsee Ost	2015	295.2 MW	Aker Verdal AS	Designed and fabricated 48 steel foundations <sup>130</sup>
			StormGeo AS	Delivered daily weather and wave

<sup>118</sup> 4C Offshore (2017). Vessels working on Bard Offshore 1. Retrieved 16.03.2017 from <http://www.4coffshore.com/windfarms/Amsterdam---MEO-/vessels-on-bard-offshore-1-de23.html>

<sup>119</sup> Ibid.

<sup>120</sup> 4C Offshore (2017). Organizations working on Riffgat. Retrieved 17.03.2017 from <http://www.4coffshore.com/windfarms/contracts-on-riffgat-de21.html>

<sup>121</sup> 4C Offshore (2017). Vessels working on Riffgat. Retrieved 17.03.2017 from <http://www.4coffshore.com/windfarms/vessels-on-riffgat-de21.html>

<sup>122</sup> 4C Offshore (2017). Organizations working on Meerwind Süd/Ost. Retrieved 19.03.2017 from <http://www.4coffshore.com/windfarms/contracts-on-meerwind-s%c3%bcd-ost-de07.html>

<sup>123</sup> 4C Offshore (2017). Vessels working on Meerwind Süd/Ost. Retrieved 19.03.2017 from <http://www.4coffshore.com/windfarms/vessels-on-meerwind-s%c3%bcd-ost-de07.html>

<sup>124</sup> 4C Offshore (2017). Organizations working on Amrumbank West. Retrieved 17.03.2017 from <http://www.4coffshore.com/windfarms/contracts-on-amrumbank-west-de05.html>

<sup>125</sup> 4C Offshore (2017). Vessels working on Amrumbank West. Retrieved 17.03.2017 from <http://www.4coffshore.com/windfarms/vessels-on-amrumbank-west-de05.html>

<sup>126</sup> Ibid.

<sup>127</sup> 4C Offshore (2017). Organizations working on Dantysk. Retrieved 17.03.2017 from <http://www.4coffshore.com/windfarms/contracts-on-dantysk-de02.html>

<sup>128</sup> Ibid.

<sup>129</sup> 4C Offshore (2017). Vessels working on Dantysk. Retrieved 17.03.2017 from <http://www.4coffshore.com/windfarms/vessels-on-dantysk-de02.html>

<sup>130</sup> 4C Offshore (2017). Organizations working on Nordsee Ost. Retrieved 17.03.2017 from <http://www.4coffshore.com/windfarms/contracts-on-nordsee-ost-de06.html>

				conditions forecasts for construction <sup>131</sup>
			Solstad Offshore ASA	Array cables installation <sup>132</sup>
			Volstad Maritime AS	Array cables installation <sup>133</sup>
			Statnett Transport AS	Cable installation <sup>134</sup>
Trianel Windpark Borkum 1	2015	200 MW	ABB AS	Design, supply and install the offshore platform <sup>135</sup>
			DNV GL AS	Design basis verification of support structure <sup>136</sup>
Borkum Riffgrund 1	2015	312 MW	Noreq AS	Wind Turbine Platform Cranes <sup>137</sup>
EnBW Baltic 2	2015	288 MW	General Cable Nordic AS	Provide a turn-key solution for the design, manufacture, supply and installation of the 150kV export cables and the 3x 12km single cores onshore cables <sup>138</sup>
			StormGeo AS	Metocean forecasting and warning services <sup>139</sup>
			Olympic Shipping AS	Array cable installation vessel <sup>140</sup>
Sandbank	2017	288 MW	Olympic Shipping AS	Cable installation vessel <sup>141</sup>
			Eidesvik Offshore ASA	Supplied vessel for the commissioning phase <sup>142</sup>
			Island Offshore	Supplied vessel for construction support <sup>143</sup>

<sup>131</sup> Ibid.

<sup>132</sup> 4C Offshore (2017). Vessels working on Nordsee Ost. Retrieved 17.03.2017 from <http://www.4coffshore.com/windfarms/vessels-on-nordsee-ost-de06.html>

<sup>133</sup> Ibid.

<sup>134</sup> Ibid.

<sup>135</sup> 4C Offshore (2017). Organizations working on Trianel Windpark Borkum 1. Retrieved 28.03.2017 from <http://www.4coffshore.com/windfarms/contracts-on-trianel-windpark-borkum-i-de27.html>

<sup>136</sup> Ibid.

<sup>137</sup> 4C Offshore (2017). Organizations working on Borkum Riffgrund 1. Retrieved 17.03.2017 from <http://www.4coffshore.com/windfarms/contracts-on-borkum-riffgrund-1-de04.html>

<sup>138</sup> 4C Offshore (2017). Organizations working on EnBW Baltic 2. Retrieved 28.03.2017 from <http://www.4coffshore.com/windfarms/contracts-on-enbw-baltic-2-de52.html>

<sup>139</sup> Ibid.

<sup>140</sup> 4C Offshore (2017). Vessels working on EnBW Baltic 2. Retrieved 28.03.2017 from <http://www.4coffshore.com/windfarms/vessels-on-enbw-baltic-2-de52.html>

<sup>141</sup> 4C Offshore (2017). Vessels working on Sandbank. Retrieved 20.03.2017 from <http://www.4coffshore.com/windfarms/vessels-on-sandbank-de12.html>

<sup>142</sup> Ibid.

<sup>143</sup> Ibid.





Annex II. Regulatory role of state from the GPN perspective.

1. Regulatory role of state							
1.1 Managing national economies		1.2 Regulating trade and industry					
1.1.1 Fiscal policies	1.1.2 Monetary policies	1.2.1 Trade strategies		1.2.2 FDI strategies		1.2.3 Industry strategies	1.2.4 Labour market strategies
		1.2.1.1 Policies towards imports	1.2.1.2 Policies towards exports	1.2.2.1 towards inward investment	1.2.2.2 towards outward investment		

Extention A. 1.2.1 Trade strategies

1.2.1.1 Policies towards imports	1.2.1.2 Policies towards exports
<ol style="list-style-type: none"> <li>1. Tariffs</li> <li>2. Non-tariff barriers</li> </ol> <ul style="list-style-type: none"> <li>- import quotas</li> <li>- import licences</li> <li>- import deposit schemes</li> <li>- import surcharges</li> <li>- rules of origin</li> <li>- anti-dumping measures</li> <li>- special labelling and packaging regulations</li> <li>- <u>health and safety regulations</u></li> <li>- customs procedures and <u>documentation requirements</u></li> <li>- subsidies to domestic producers of import-competing goods</li> <li>- countervailing duties on subsidised imports</li> <li>- local content requirements</li> <li>- government contracts awarded to domestic producers</li> <li>- exchange rate manipulation</li> </ul>	<ul style="list-style-type: none"> <li>- financial and fiscal incentives to export producers</li> <li>- export credits and guarantees</li> <li>- setting of export targets</li> <li>- operation of overseas export promotion agencies</li> <li>- establishment of export processing zones and/or free trade zones</li> <li>- "voluntary export restraint"</li> <li>- embargo on strategic exports</li> <li>- exchange rate manipulation</li> </ul>

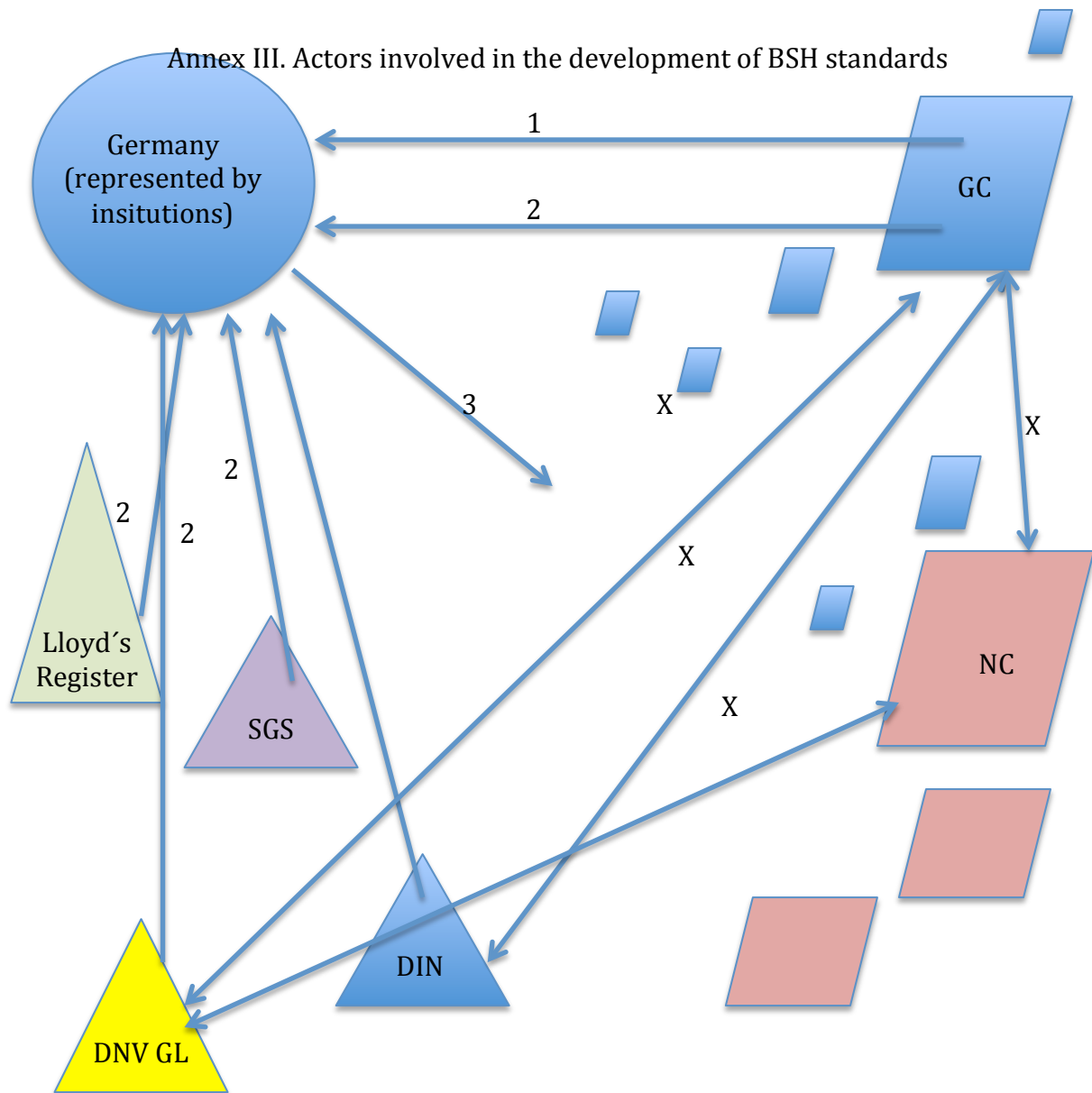
Extention B. 1.2.2 FDI strategies

1.2.2.1 towards inward investments	1.2.2.2 towards outward investments
1.2.2.1.1 Entry: government screening of investment proposals, exclusion of foreign firms from certain sectors or restriction on the extent of foreign involvement permitted; restriction on the degree of foreign ownership of domestic enterprises; compliance with national codes of business conduct (including information disclosure).	Restrictions on the export of capital, necessity for government approval of overseas investment projects

<p>1.2.2.1.2 Operations: insistence on involvement of local personnel in managerial positions; insistence on certain level of local content in the firms activities; insistence on a minimum level of exports; requirements relating to the transfer of technology</p> <p>1.2.2.1.3 Finance: restrictions on the remittance of profits and/or capital abroad; level and methods of taxing profits of foreign firms</p> <p>1.2.2.1.4 Incentives: direct encouragement of foreign investment: competitive bidding via overseas promotional agencies and investment incentives</p>	
---	--

Extention C. 1.2.3 Industry strategies

1.2.3.1 Investment incentives: capital-related or tax-related
1.2.3.2 Labour market policies: subsidies, training
1.2.3.3 State procurement policies
1.2.3.4 Technology policies
1.2.3.5 Small firm policies
1.2.3.6 Policies to encourage industrial restructuring
1.2.3.7 Policies to promote investment
1.2.3.8 Merger and competition policies
1.2.3.9 Company legislation
1.2.3.10 Taxation policies
1.2.3.11 Labour market regulation: labour union legislation, immigration policies
1.2.3.12 National technical and product standards
1.2.3.13 State ownership of production assets
1.2.3.14 Environmental regulations
1.2.3.15 Health and safety regulations



This figure is an effort to explain the process of the BSH standards development. Circle is used to mark the national institutions representing the state (Germany in this case), triangles symbolise SDOs, while parallelogram marks companies. While blue color is used to mark German origin of the actor and pink – the Norwegian, other colors are chosen randomly and symbolise their different location (within the borders of other states).

The first arrow shows the industry's expression of a need for standards. Afterwards (arrow 2) both domestic and foreign (operating globally) standardisation and certification bodies and consultancy firms together with the industry representatives acted as experts during the development of standards. After several rounds of discussion and comments by main stakeholders, the BSH issued the standards (arrow 3 points in the middle, since the standards are supposed to regulate the whole domestic industry, but not some specific actors). Additionally, we can see the interactions between national and foreign companies and SDOs. Although, it is not necessarily known in this case when they took place, the main goal of this figure is to show the complexity of the whole process.