Offshore Wind Power

Opportunity and strategy for a small engineering consultants firm

Master of Science Thesis in Management and Economics of Innovation

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Executive summary

GVA is a small engineering consultancy firm, with specialized focus in design of floating structures such as oil production platforms. The key business is at the oil and gas market, but the firm also have some projects at other markets. One of these is the offshore wind industry, which is a growing market with great potential in the near future. GVA has some experience in offshore wind and see greater potential in the industry to diversify their business.

The purpose of this master thesis is to analyse the potential for GVA in the offshore wind market by looking at industry drivers, the underlying market development, as well as the industry structure. By matching the market characteristics with GVA resources and capabilities strategies for entering the market can be derived. The focus is narrowed down to three specific segments of the offshore wind market, where GVA has suitable competence and that can be entered with limited investments.

Within the segments, substations, fixed foundations, and floating foundations, GVA can utilize existing in-house knowledge and hence carry out projects at lower risk. The analysis confirm the potential in the industry, but also the challenges which needs to be overcome in order for the offshore wind market to experience rapid growth. GVA's main advantages are within the substation segment, because of the largest design scope, their former experience, existing customer relationship and possibility to enlarge the product offering. However, the analysis also shows a great future potential for GVA in floating foundations. The floating foundations segment is still in an emergent stage without dominant design and large commitment would be required to enter at this early point. Competition within fixed foundations is fierce and economies of scale are getting increasingly important. Therefore, this segment is not considered as attractive to GVA.

Overall, GVA's strengths lie in their offshore competence and experience in the oil and gas industry combined with the design expertise. On the contrary, the technical knowledge needed in offshore wind is not as advanced as in GVA's other projects. Also, GVA is currently dependent upon one customer in offshore wind and their lower willingness to accept risks can block further development in the market. The analysis also shows that offshore wind customers value customer intimacy and operational excellence higher, in contradiction from oil and gas clients who value product leadership as the most important. This implies a need to adjust current strategies to satisfy customers in offshore wind better.

The recommendations suggest focusing on customer intimacy as a differentiator at the market, but also to take a more active role in industry development and to seek new customers. By focusing on being an offshore advisor and increasing the product offering with partners this can be achieved. However, the most important recommendation for GVA is to clearly define their goal and wanted position in order to guide in decisions and to support activities performed.

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Carin Jobson Sellström and Göran Nilsson

Gothenburg, 18th of August 2010

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List of abbreviations

AC – Alternating current

BWEA – British Wind Energy Association

CAPEX – Capital Expenditures

DC – Direct current

EPC – Engineering, procurement and construction

EPCI – Engineering, procurement, construction and installation

EWEA – European Wind Energy Association

FEED – Front end engineering and design

GWEC – Global Wind Energy Association

HVDC – High Voltage Direct Current

KBR – Kellogg, Brown and Root Ltd. (GVA's mother company)

kWh – Kilowatt hours

MW – Mega Watt

PEST – Political, economical, social and technological

OFTO – Offshore Transmission Operators

1 Introduction

This section briefly introduces GVA Consultants, the company this thesis is written for, the wind power market, the purpose and the limitations of the study.

An important success factor for firms is the ability to move into new expanding markets. Offshore wind power has been identified as a potential new and growing market opportunity for GVA Consultants. It requires knowledge in offshore engineering and design, which is part of GVA's core competence. GVA has previously performed a few projects in the sector on consultancy basis and consider expanding the scope in the industry to diversify their business. To successfully enter the industry it is important that the firm adapts its strategy and business model to the offshore wind industry.

1.1 GVA – An offshore engineering design firm

GVA Consultants is a small but leading firm within marine and offshore design, mainly within the oil and gas industry. Originally, GVA was a part of the shipyard Götaverken Arendal and when the shipyard closed down in 1989 GVA Consultants was formed from the shipyards technical departments. Since then GVA has focused its activities on engineering design and conceptual studies for offshore structures such as oil rigs and other floating platforms and units. In 2001 GVA became a subsidiary of Kellogg, Brown & Root (KBR), which is a large American engineering, procurement and construction company in the petroleum and energy industries.

GVA's scope is within conceptual and basic engineering designs as well as in consultation and project management. Their objective is to provide customers with specialized knowledge in design of vessels, but also experience and competence during the whole process of procuring, building or upgrading a vessel. GVA also pursues own research and development to develop new concepts and enhanced solutions to customer needs.

GVA is a global firm and is well accustomed with the various conditions offshore, concerning regulations, certification and needs. GVA has some experience of working in offshore wind projects and has assisted in issues regarding designs, certification and safety requirements.

1.2 The wind power market

To understand the offshore market, it is important to also understand what drives the underlying wind market. Two key drivers of the wind power market are the energy challenge, which the world is facing, as well as the environmental challenge. The wind market situation is described to briefly provide an understanding of the whole picture, since the offshore wind market is a small sub-market to the wind power market.

1.2.1 Energy challenge

Energy is essential for many activities in modern society and the global energy production has increased by around 1.9 % annually from the 70s (IEA, 2009). The IEA (2009) long-term projection is that the demand for energy will increase by around 2.5 % annually until 2030, which would increase the energy demand by an additional 40 % compared to current demand level. While fossil fuels are dominating the global energy supply, renewable energy sources produce 13 % of supply, with wind energy contributing a mere 0.064 % of global energy in 2004 (see Figure 1). While wind energy has grown steadily for a number of years and is predicted to grow significantly the upcoming years, the contribution to the global energy supply is still limited.

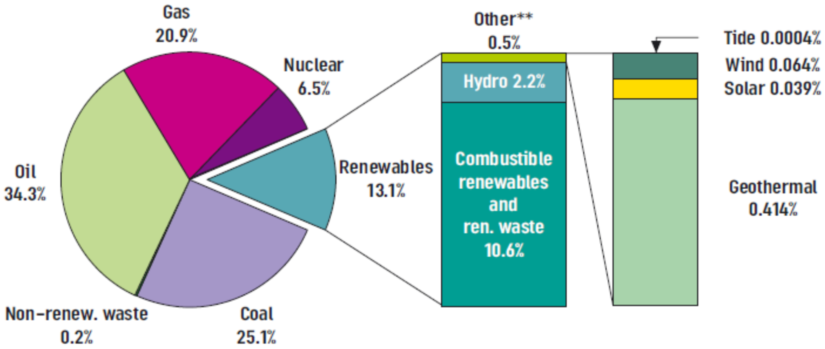

Figure 1 Global energy supply by source. Source: IEA Statistics (2005)

With limited resources of oil and gas, Europe is heavily dependent on energy imports. EU member states are currently importing 50 % of their energy needs, a figure that is expected to rise to 65 % in 2030 (Belkin, 2008). A questioning of the future availability of energy, as well as the dependency on other regions has caused concern in EU on energy resources. This has led to actions to address the situation by forging an Energy Policy to increase the use of locally produced renewable energy.

1.2.2 Environmental challenge

While the negative environmental impact from the use of fossil fuels have been known for quite some time, the concern has increased over the last couple of years due to several reports and new scientific findings. The Intergovernmental Panel on Climate Change (IPCC) fourth assessment report was completed in 2007 with strong scientific proof of negative environmental impact caused by human activity. Another important development is the documentary "*An Inconvenient Truth*" showing Al Gore's campaign to educate the public on global warming. The documentary shows how human activity impacts the environment and what we can do to change the development.

The Kyoto Protocol is an international agreement that is linked to the United Nations Framework Convention on Climate Change (UNFCCC) that sets binding targets for 38 industrialized countries and the European Union for the reduction of green house gas (GHG) emissions (UNFCCC, 2010) The target amounts to a reduction of an aggregate 5.2 % against 1990 levels over the five-year period 2008-2012 (EWEA, 2010, Chapter 5). The protocol is a major milestone in global climate change legislation since it covers most developed nations.

The energy sector has a major role in the negative impact on the environment. In Europe, energy amounts to 80 % of GHG-emissions, with electricity and heat production being the largest emitting sectors (EEA, 2008).

Renewable energy sources have been recognized to contribute to a reduction in climate change mitigation through reduced GHG emissions (EWEA, 2010, Chapter 1). Wind energy has an important role in reducing emissions from electricity production. Life Cycle Assessments (LCA) that have been made for wind power show strong benefits compared to fossil energy sources (EWEA, 2010, Chapter 5).

1.2.3 The market situation

The wind power market has grown significantly over the last decade. The global wind market grew by 41 % in 2009 despite the financial crisis, far above most forecasts (GWEC, 2010). The global annual and cumulative growth can be seen in Figure 2.

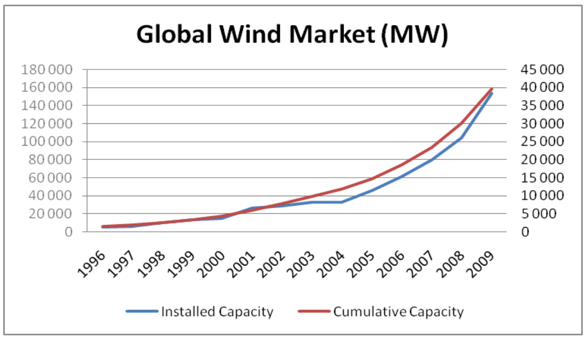

Figure 2 Global annual and cumulative wind power installations

The wind market has seen a tremendous growth over the last decade and most forecasts are assuming that the growth will continue for many years to come. Figure 3 shows some long-term projections for the industry, with a variation from 120 to 320 GW installed in Europe by 2020. This shows the uncertainties involved in forecasting the growth in a fast growing industry.

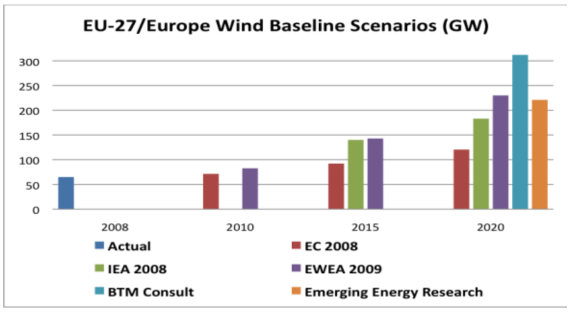

Figure 3 Future wind market projections

Offshore wind installations have recently emerged as a complement and alternative to onshore installations. It is generally easier to find strong and stable wind supply offshore, and thereby increase the power production from a wind turbine. Another benefit is the ability to place turbines where there is less visual impact.

The wind turbines used offshore are generally modified versions of onshore turbines. But apart from wind turbines, there is also a need for offshore foundations and substructures to support the turbine towers, as well as installation vessels for demanding offshore activities. These areas have strong similarities to what is currently being done in the offshore oil and gas industry. This opens up new opportunities for firms in the oil & gas industry to diversify their business.

1.3 Problem formulation and purpose

The purpose of this thesis is to analyze the potential opportunity for GVA to enter the offshore wind market. We address the issue by first taking a demand-side perspective to understand the industry drivers and challenges. Secondly, we look at the supply side of the industry to see how firms are meeting the demand and the competitors that are present. Finally, we analyze potential for GVA in the industry by looking at their capabilities and the requirements in the industry. The approach can be summarized in the following research questions:

1. *Demand:* What are the future prospects for the offshore wind power industry?
2. *Supply:* How is the industry structured (the selected segments) and how may it change?
3. *Strategy:* What role can GVA have in the offshore wind industry?

1.4 Delimitations

The thesis is based on studies of the market carried out during the spring 2010, and changes in project structures and actor relationship after that is not considered. The report is delimited geographically to Europe, and hence excludes activities, actors and developments in other continents like Americas and Asia.

This report is delimited to investigate the parts of the industry structure, which is of relevance for GVA under the assumption that limited investment is required for entering. Also, within the relevant industry branches only the largest and most significant actors have been investigated further. Due to the emergent state of the industry many actors have been involved, but those considered being market leading (decided by market shares) are in focus.

2 Methodology

This chapter describes and elaborates upon the different methods used in the process of writing this thesis. Focus is to provide a description of the methods used and also why and how these methods have been combined.

2.1 Research strategy

The thesis aims to investigate a new area with the purpose of suggesting firm-specific recommendations. This thesis is of empirical nature since it aims to study the reality of concepts in their natural context (Bryman and Bell, 2007). Different theories are combined to analyse the concepts in the study. A theoretical framework with existing theories within strategy and business evolution is used to structure the thesis and to consider general concepts and their applicability to the firm-specific environment.

The research is based on a case study, where the market and firm in focus is studied in its natural setting. Because of the natural setting, the boundaries of the case study are unclear compared to an experimental hypotheses study. This thesis aims to answer questions of how and why, and according to Bryman and Bell (2007) a case study useful in these types of studies.

2.2 Data collection

The nature of the thesis made it necessary to collect a vast amount of data about existing offshore wind farms, actors and potential entrants in the industry. An extensive database including existing, under construction and planned offshore wind farms were compiled to map the developments and actors involved. The database was then used to derive data about and analyze the market from different perspectives. This database was used to derive graphs and diagrams on, for example, trends in offshore parks.

2.2.1 Quantitative data

Quantitatively collected data is mainly based on information available on various web pages, in reports and magazines. Therefore, the data is gathered from secondary sources but considered acceptable due to the nature of the data (i.e. number of existing offshore farms) and the rationale behind describing the offshore wind market.

2.2.2 Qualitative data

Qualitative data is based on interviews made with actors knowledgeable within the offshore wind industry. The sample is a so-called convenience sample, which means that the sample is "…available to the researcher by virtue of its accessibility." (Bryman and Bell, p. 197, 2007). The sample has been complemented by a snowballing method where interview objects have been asked to suggest other people that would be of interest for this thesis to talk to. The method can cause problems with validity and reliability aspects and can limit the ability to generalize results (Bryman and Bell, p. 197, 2007). However, the time for sampling is considerably shortened and relevant interview objects are more easily found.

Interviews

The interviews performed during this thesis have been semi-structured, aimed to give a deeper understanding of the quantitative data and also to derive future scenarios for the industry. Qualitative interviews are driven by the experience and opinions of the interviewee (Patel and Davidson, 2003). The semi-structured interviews were prepared in advanced and asked in an open manner, to open up for a broad discussion. When picking up something particularly interesting during the interviews, the interviewers focused on this rather than following the initial questions.

Interviews were conducted with owners/developers of offshore wind farms, GVA competitors and customers (actual and potential) and also educated experts within academia. Interviews have been performed both over the phone and face to face. Some interviews were planned in advance with a pre-determined time slot while others were small talks at a fair or when meeting/calling people at random times. A general interview guide used can be found in appendix A.

2.3 Framework for analyzing data

The data collected for this thesis comes from a various number of sources and is of different nature. By combining quantitative and qualitative data, the objective of both giving a snapshot of the market structure today, how it may change and GVA's role can be analyzed. This is referred to as triangulation, where multiple sources are used to reach a more accurate result. Both triangulation and complementarity are used to crosscheck and dovetail data (Hammersley, 2008).

The core of analysis lies in the search for explanations, understanding and development combined with theoretical theories and concepts (Blaxter et al., 2006). The data is analyzed from different perspectives based in the general theories regarding new business creation, which are explicated further in Chapter 3: Theoretical framework. Quantitative data is analyzed and partly presented graphically to detect trends, show market shares, etc. to enable a deeper understanding. The qualitative data is used for explaining concepts but also to develop ideas and appreciate future implications. The study looks at the industry from three different perspectives; demand side, supply side and a strategic perspective for GVA.

2.3.1 Demand side

This part seeks to provide a broad understanding of the market drivers and challenges. Articles and prepared documents from relevant trade organizations and magazines as well as from consultancy firms have been used as main sources for this part. The compiled database was used to derive trends in the market. We also performed semi-structured interviews with potential customers (Vattenfall and ABB) and attended a conference in Warszaw with several interesting presentations to expand the understanding of the demand side of the market.

2.3.2 Supply side

The supply side of the industry is studied by analyzing the actors in different parts of the value chain. Topics included are the organization between firms and contract structures. Most data is derived from public sources such as reports, articles and also from company presentations and references. The data was used to construct a database with involved companies and their specified contract scopes. Other information sources were semi-structured interviews and small talks with business people and academic experts.

2.3.3 Strategic perspective

GVA's opportunity to make offshore wind power a new business area is analyzed by combining the facts about GVA (competences, organization, etc.) with the derived market structure details. This part intends to highlight if, why and how GVA can make it a new business area. This part presents the background on why new business development is essential for firms, and how a firm's competitive position can be sustained and enhanced through new business creation. The theory is extended into strategies to sense, seize but also manage a new business opportunities, which possibly could become new business for a firm. This framework is intended to anchor the study with well-established concepts within academia and to structure the analysis. Sources include articles from well-known journals and books. Information is mainly collected through semi-structured interviews but also from company specific documents.

2.4 Reliability and validity

Reliability concerns if the study is repeatable, and is closely related to replicability that refers to if the study can be replicated by another researcher (Bryman and Bell, 2007). Validity on the other hand, concerns whether the study measures what it is intending to measure (Bryman and Bell, 2007). Since it is a case study and this type of study is based upon a setting that constantly changes, repeatability is hard to ensure. Also, many sources are business people who might change employer or even industry. However, the quantitative study of the market could probably be replicated since it is based upon official and published information.

The thesis is considered valid from an internal point of view due to several reasons. According to Bryman and Bell (2007) case studies can give high internal validity if concepts are systematically related and findings are consistent. The results are considered coherent and the relations between concepts have been confirmed by different sources. This type of research can also give high ecological validity, which means that results are applicable to everyday settings if it is based on thick descriptions and people's views and opinions (Bryman and Bell, 2007). The thesis does indeed provide thick descriptions on the subject, and people's opinions about prevailing conditions have been included through interviews preformed.

Case studies rarely give high external validity due to the limitation to a single organization, location, market etc. (Bryman and Bell, 2007). As for most case studies, this thesis is most probably not applicable in an external environment. This is due to its focus on a specific firm and the adjustments of general ideas to suit the firm. Still, the idea of this thesis is not to contribute to general concepts but to give specific recommendations. Consequently, the low external validity is not seen as problematic for the thesis.

Some of the quantitative data used is published by secondary sources but considered to be valid. Validity is seen as acceptable because all sources were checked to be from reliable actors active within offshore wind or similar. However, interview objects were chosen through a convenience sample, which means that it is impossible to generalize the results because it is impossible to know if the sample is representative for the population. Also, data from interviews is affected by the author’s perception, both through the questions asked and how answers are interpreted and analyzed. Additionally, answers might be biased or incomplete due to the interviewer or interviewees’ personal opinions or other reasons e.g. hidden agendas, firm politics or educational background.

3 Theoretical framework

This chapter presents and reasons around existing theories available in academia, which are useful for performing this study. In the end of the chapter, theoretical implications are presented to further connect theories to the overall thesis.

"Without new business, competition will erode volumes, margins and profits." (Sjölander, 2009c)

Firms must consider future potential in both existing but also new business to remain profitable and stay competitive compared to rivals and entrants. Hence, future profits of a firm cannot only be based on the current activities. As shown in Figure 4, profits from the present business activities will most probably be reduced due to competition and this creates a need for firms to find new ways to sustain profits. Innovativeness in terms of product improvements, new markets for existing products, acquisitions and complementing existing products but also new business creation, both organic and acquisitions, are ways to develop the business and build future profits.

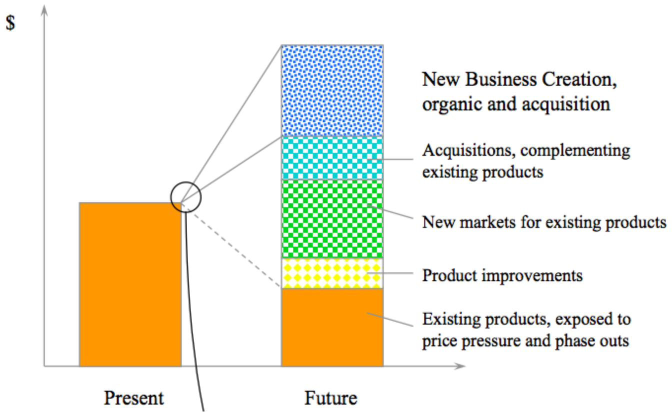

Figure 4 Future profits cannot only be based on present business activities. Source: Sjölander (2009b)

To diversify and venture in opportunities, creating new business is the most uncertain and risky way, since new knowledge about both products and markets are needed. However, the potential in new business opportunities is significant and an important part in a firm's long-term growth (Garvin, 2004). According to Garvin (2004) firms should be aware that starting new businesses is mainly an experiment and most of them fail. Businesses are more likely to succeed when firms know the pitfalls and how to adapt. New businesses take a lot of time and quick returns are generally not the case. But extensive market knowledge in combination with demand-driven products improve the probability of success (Garvin, 2004). Also, firms need to consider that different management styles in the new and existing business and in the different phases of the new business life cycle. Finally, an open mind is indispensable since the corporate culture is a prime threat to success (Garvin, 2004).

To stay competitive in the rapidly moving business environment, Teece (2007) specifies that a firm need more than unique assets. Since the current business cannot build the firm's future profits dynamic capabilities are needed to "…create, extend, upgrade, protect…" (Teece, 2007, pp.1) the firm's assets continuously. The framework of dynamic capabilities is used to describe how a firm can sustain and enhance its competitive position by adapting to changing customer needs and create new business to diversify the business (Teece, 2007).

Dynamic capabilities are the capacities of a firm " (1) To sense and shape opportunities and threats, (2) To seize opportunities, and (3) to maintain competitiveness…" (Teece, 2007, pp.1). The framework of dynamic capabilities is originally built upon well-recognized theories and frameworks, such as competitive forces by Porter, strategic conflicts by Shapiro, Schumpeter's views on economic development, but also views from Penrose, Williamson, Barney, Nelson and Winter and Teece et al. (Teece, Pisano and Shuen, 1997).

Evaluation of the dynamic capabilities is made with two measuring sticks; technical fitness and evolutionary fitness. The first refers to how well the firm performs its business, i.e. customer satisfaction with current functions, while the other defines how well firms adapt and stay competitive over a longer period of time (Teece, 2007). Dynamic capabilities help in reaching evolutionary fitness and thereby build future profits.

The dynamic capabilities framework also emphasize competences which need to support the processes of sensing, seizing and managing threats to maintain competitiveness in the long run (Teece, 2007). These organizational and strategic managerial process competences include coordination/ integration, learning and reconfiguring (Teece, Pisano and Shuen, 1997).

Coordination and integration are both of great importance for firms in external and internal activities. Being efficient and effective in business activities makes the difference between positive and zero profits (Teece, Pisano and Shuen, 1997). Learning is the process of which repetition and experimentation lead to better performed tasks, but also the finding of new opportunities through interaction. Lastly, reconfiguring is the capacity of transforming and since change is costly firms need to create an environment where the cost for transformation is minimized (Teece, Pisano and Shuen, 1997).

In conclusion, firms constantly need to change their business and find opportunities, seize them and managed the transformation in order to sustain a competitive advantage. In the coming sections the dynamic capabilities needed when diversifying and developing new businesses are further elaborated on.

3.1 Finding and prioritizing new businesses opportunities

The identification and selection of a new opportunity is much about finding the "sweet spot" (Figure 5 The sweet spot). This relates to the intersection of an attractive opportunity in combination with the interest, passion and commitment of the firm and capabilities and skills (Dorf and Buyers, 2008). Hence, it is the concurrence of a customer segment, technology and firm specific competence and the opportunity of the applications (Dorf and Buyers, 2008).

Figure 5 The sweet spot

According to Teece (2007), the process of sensing and shaping is "…much a scanning, creation, learning, and interpretive activity". This implies a constant search for opportunities, which possibly match the "sweet spot" of a particular firm. When seeking for innovation opportunities there are both internal and external sources. Internal areas of opportunities include unexpected occurrences, incongruities, process needs and industry and market changes (Drucker, 1985). Opportunities created because of external sources include for example demographic changes, changes in perception and new knowledge (Drucker, 1985).

The sensing and shaping phase need to be decentralized throughout the firms units in order to avoid missing chances for development (Teece, 2007). The firm needs to search close to their core but also in periphery of the business ecosystem. However, one of the most important factors for successfully finding and deploying opportunities is the understanding of customer needs (Teece, 2007). Furthermore, it is of significant value to analyze opportunities in their context and combine it with what the firm is prepared to invest in terms of organizational and financial means.

Since industries follow certain lifecycle stages firms need to understand how a particular opportunity is affected if the concerned industry is in emergent, growth, maturity or decline phase (Dorf and Buyers, 2008). In the emergent stage of an industry few firms compete with different technologies and demand is limited (Grant, 2008). This implies a great potential and the opportunity to become market leader but it also means demands in terms of resources and risk taking for the firm. However, many new entrants, increased competition and the emergence of a dominant design characterize the growth phase. The potential of an opportunity is therefore decreasing due to standardization and arising price competition (Utterback, 1994). During the maturity phase the demand is stabilizing and some market actors tend to obtain all market shares. Consequently, every opportunity needs to be evaluated against the uncertainties of it. These include market, organizational, managerial, product, process, and regulation, legal and financial uncertainties (Dorf and Buyers, 2008).

Conclusively, choosing opportunities is not only a matter of finding an attractive area but to match the discovered need with the market characteristics and firm specific resources, capabilities and willingness to venture (Teece, 2007). This is strongly connected to the current business; an existing business perceived as sustainable mean less need for large new businesses short-term, but an increased need long-term.

3.2 Matching company with new business opportunities

The potential with opportunities discovered and the number of investment paths are infinite. When opportunities matching the “sweet spot” have been identified, the next step is to analyze how a particular opportunity’s potential is most appropriately captured. Business models fitting the opportunity, evaluation of the current position and capabilities but also the future wanted position need to be analyzed simultaneously.

The objective is to derive the most beneficial combination and to see gaps in current business to reap maximal profits. In order to seize opportunities the firm also need to set the enterprise boundaries and this can according to Teece (2007) be seen as an element in the business modeling. Finally, the firm has to manage possible complements required and recognizing probable decision errors to avoid bias, delusion, deception and hubris (Teece, 2007).

Teece (2007) highlights that despite analysis of the opportunity, business and wanted position, management need to make decisions under great uncertainty. Decisions regarding investments, timing and how to leverage need to be strategized. Recognition of differences between the existing business and the new opportunity is essential since judgments cannot be made upon the same characteristics (Teece, 2007). Being too risk-averse can handicap the business to miss new opportunities, but excessive optimism cause investments in negative return projects. Therefore, unbiased but reinforced decisions are of great importance in investments.

3.2.1 Deriving strategy – the most appropriate business model

Dynamic capabilities means that firms need to create, adjust and replace business models when necessary, as when investing in new opportunities. Designing a business model demands creativity, intelligence and a great amount of market and industry knowledge (Teece, 2007). However, the probability of success is increased if a good understanding of customer needs is developed and profound knowledge about the value chain is collected (Teece, 2007).

A successful business model gives the firm good potential to achieve a beneficial position at the market and represents the logic of the business opportunity (Osterwalder, 2009). According to Sjölander (2009b) a business model combines the outcome of the two most applied strategy tools, namely Porter’s framework and the resource-based view (further elaborated on below). The knowledge needed to derive a model for entering a business to take advantage of an opportunity is accumulated when analyzing the external environment and matching it with firm specific resources and capabilities.

Porter’s framework: Evaluation of a firm’s market position

The objective with the framework is to analyze an industry’s attractiveness and decide what line-of-business(es) a specific firm should compete in. By describing an industry’s structure, an understanding of the competition and profitability drivers within an industry can be achieved (Grant, 2005). The main elements of Porter’s five forces which combined can be used to determine the industry attractiveness are; (1) industry rivalry, (2) threat of new entrants, (3) bargaining power of buyers, (4) threat of substitutes and (5) bargaining power of suppliers (Porter, 1980).

(1) The industry rivalry can strongly affect the profitability within the industry, since many or equal actors increase competition. The competition must not be on price, but can as well be on faster new product launch times or advertising (Grant, 2010). If competition focus is on adding customer value (e.g. better quality), the profitability will be affected lesser (Porter, 2008).

(2) The threat of new entrants is decided by the existence and strength of entry barriers i.e. the advantage existing actors have to win customers compared to new players. Economies of scale is one of the key entry barriers, since large investments in fabrication facilities etc. can discourage new actors to enter (Grant, 2010).

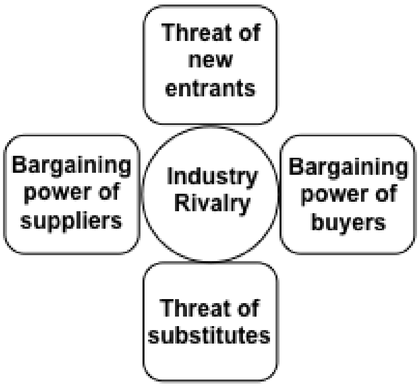

Figure 6 Porter's five forces. Source: Porter (1980)

(3) The bargaining power of buyers is affected by two key factors, the buyer's price sensitivity, i.e. the importance of the product for the customer, and relative bargaining power, i.e. cost for the actors to cease the contract (Grant, 2010).

(4) The threat of substitutes is high if the product in question is simple and many other actors can provide the same function but with another solution. The substitute must not be cheaper to pose a threat, it only needs to perform better (Johnson et. al, 2008)

(5) The bargaining power of suppliers is determined by the number of actors, fewer mean more supplier power, the customers' dependency on a particular supplier and the cost for the customer to switch supplier (Porter, 1980).

This positioning view of strategy is criticized for its static nature and sole focus on the external environment (Teece, 2007). However, the applicability of the Porter's five forces framework is considerable when the focus is to understand and analyze industry characteristics and its attractiveness (Grant, 2008). This knowledge can in combination with trends and anticipated structural changes be used to forecast profitability in the future and further design strategies for competing (Grant, 2005).

The resource-based view: Analyzing capabilities and resources
Contrary to Porter's framework the resource-based view is merely focused on internal activities. By analyzing a firm's resources (tangible, intangible and human) and capabilities an internal assessment of the firm's potential competitive advantage is achieved (Grant, 1991). Resources are defined as non-specific to the firm (such as capital and equipment), while capabilities are firm specific. A capability is therefore the capacity for performing a task with the resources held by the firm. To analyze the strength of the competitive advantage, resources and capabilities are evaluated towards four criteria.

These are valuable, rare, in-imitable and non-substitutable. Altogether, it is the combination and integration of the firm's resources that finally makes up the competitive advantage. Another important factor concerns the returns and the firm's ability to appropriate returns, since it not only depends on the competitive advantage.

Altogether, Porter's framework and resource-based view are considered to have internal weaknesses for solely deriving strategy. Nevertheless, the combined value of the two strategy tools in a larger perspective is acknowledged and exploited.

3.2.2 Boundary management

Setting boundaries include deciding upon what appropriability regimes (i.e. natural and legal protection of opportunity) that are necessary, which complementary assets are needed and the relative position of the firm and potential imitators toward these assets, but also the prevailing industry lifecycle phase (Teece, 2007). Failure to set boundaries can mean a lower value capture than possible and failing to stimulate the market development in the desired direction (Teece, 2007).

3.2.3 Complements and management of possible decision errors

The constantly changing market dynamics have pushed the scale and scope of firms and outsourcing has in many cases become more beneficial than in-house activities (Teece, 2007). This implies a co specialization that pressures firms to manage their interaction towards complement firms carefully. Strategic decision-making must therefore also include how complements affect the way a firm chooses to invest in an opportunity. Even the interfaces between firms evolve and this makes decisions increasingly complex.

Avoiding decision errors and managing delusion, deception and hubris is essential when seizing an opportunity. Firms must create organizational structures and routines to incentivize individuals to objectively evaluate opportunities and analyze the ways to seize them (Teece, 2007).

Conclusively, seizing opportunities is a complex and resource demanding process due to the amount of knowledge needed to minimize the risk of investing in negative return projects. The process incorporates business modelling by analyzing the environment, both internally and externally, in order to identify gaps when aiming for a future position within a market. The strategy derived is well reinforced and as objective as possible if the process is managed carefully. However, as mentioned before, decisions regarding new business opportunities are always made under uncertainty and no guarantees concerning future profits are possible.

3.3 Managing threats and staying competitive

Successfully sensing and seizing an opportunity can lead to firm growth and increased profits. A larger resource/capability base and strong technical fitness towards a specific customer can mean that the firm becomes path-dependent (Teece, 2007). Christensen and Bower (1996) argue that the way resources are allocated creates a dependence, which can cause failure to adapt. This path dependency can lead to openings for new firms to enter and win market shares. The key to maintain evolutionary fitness is the ability to constantly evaluate, recombine and reconfigure the business activities in the same pace as the market changes. Only by reconfiguring can firms avoid disadvantageous path dependencies (Teece, 2007) and thereby avoid losing against competitors.

Examples of unfavorable paths are anti-cannibalization decisions made by established firms (Teece, 2007). This means that firms avoid investing in opportunities, which possibly could reap profits from another existing product/service. However, the firm might miss that the potential of the opportunity is larger than profits from existing business. In this manner, routines and established rules can become rigidities that block development and improved performance (Leonard-Barton, 1992). The paradox lies in using the core capabilities of the firm as advantage when developing opportunities, but to avoid being caught in the embedded structures of the capabilities (Leonard-Barton, 1992).

The focus of business activities is to constantly strive for the most beneficial strategic fit to maintain competitiveness. Therefore, co specialization[1] must be managed and reconfiguring an integrated strategy in rapidly moving business environments (Teece, 2007). To successfully utilize co specialized assets is important part of the dynamic capabilities. It is also of great importance that the firms understand the value of intangible assets and include knowledge management and corporate governance in business strategy (Teece, 2007). Threats to sustaining the competitive advantage include poorly formulated incentives and blocking of knowledge transfer due to too strict boundaries.

Conclusively, sensing and seizing opportunities needs to be complemented with strategies to manage threats that can arise to stay competitive in the long run. The business activities need to be analyzed and revised depending on external changes in the market but also internal changes in the organization or similar.

3.4 Theoretical implications

The dynamic capabilities framework is viewed as a structured approach when analyzing how a firm can develop and stay competitive in a dynamic market. It is of importance to evaluate opportunities and develop strategies, both for general purposes and for specific opportunities. Overall, the framework consisting of sensing, seizing and maintaining competitiveness is a way to understand and actively analyze the activities of a firm. By constantly renewing and protecting the business, the competitive advantage can be sustained and enhanced even in a dynamic marketplace.

The firm in focus for this report, GVA, has sensed an opportunity and therefore is this thesis aimed to analyze its potential and derive strategies. However, the opportunity to enter the offshore wind market is also analyzed from a sensing perspective, but not in relation to other opportunities such as wave power applications.

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[1] Co specialized assets are assets which value is a function of its use in combination with another asset.

To analyze the market and industry structure, both demand and supply are essential parts to consider before developing a strategy for GVA. Also, GVA’s internal resources and capabilities are described and analyzed to further build the strategy. The gaps between actual and needed resources and capabilities depending on the “sweetest spot” at the market lay the basis for the overall strategy.

4 The offshore wind market

This section presents the offshore wind market and how it is linked to the onshore wind market. Key factors driving the industry are presented as well as trends. Finally, conclusions on the future prospects of the industry are provided.

Offshore wind has emerged as an interesting alternative to onshore installations since it enables large-scale production of electricity in remote areas which could contribute significantly to the energy markets. An offshore wind farm includes a number of turbines mounted on foundations in the sea and are connected to the electricity grid either directly or through an offshore transformation substation. A technical description of an offshore wind farm can be seen in appendix B. The industry is largely driven by policy since the installations generally require subsidies to be financially viable. Beneficial policies in the U.K., Germany, Denmark and other countries have given necessary support for the industry and several large scale installations are operational or and under construction.

4.1 An emerging market

While the onshore wind market is a large global industry in major growth, the offshore wind market is still in an early, emerging stage. In the end of 2009 the cumulative onshore installations amounted to almost 160GW compared to approximately 1.9GW of offshore installations (EWEA, 2009a; GWEC, 2009).

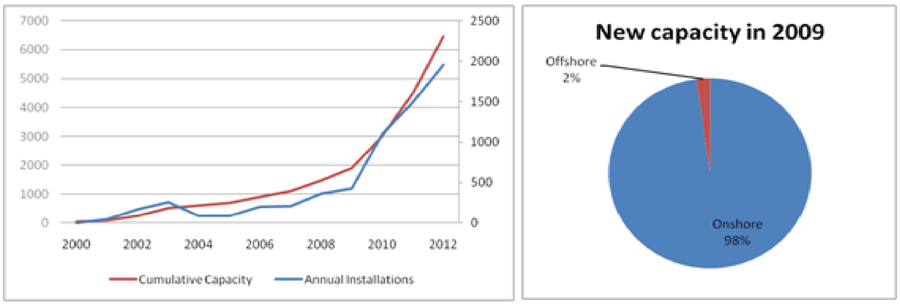


Figure 7 Annual and cumulative forecasts for Europe. Source: EWEA (2009a)

The offshore market currently only constitutes a 2 % share of the total wind market (EWEA, 2009a), and the annual and cumulative forecasts can be seen in Figure 7. The offshore market is growing rapidly and EWEA (2009a) expect a 77 % growth until 2013. In the longer perspective, EWEA (2009a) has installation targets where the European offshore market contributes around 25 % of new installations or 40GW of cumulative capacity in 2020 (as shown in Figure 8). This target amounts to a cumulative annual growth of around 28.7% between

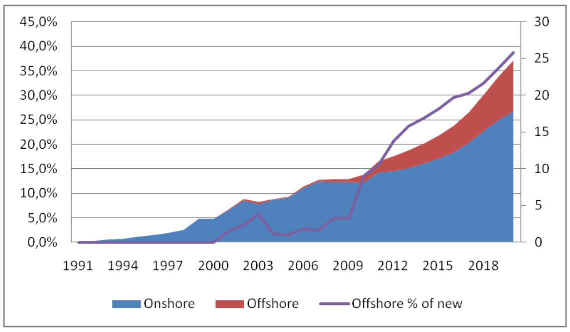


Figure 8 Wind installation targets to 2020. Source: EWEA (2009a)

2009 and 2020 (EWEA, 2009a). While this is an aggressive target, it is far below the national targets. In fact, UK alone has set a target of reaching 33GW of offshore capacity by 2020 (BVG Associates, 2010).

4.2 Offshore vs. Onshore

According to BWEA (2009), the offshore wind industry is still highly dependent on other industries as seen in Figure 9. They argue that once the industry grows to around 1GW per annum in UK, suppliers can justify inward investment in offshore technologies. For example, there are currently no dedicated assembly lines for offshore turbines; instead turbines are assembled in onshore manufacturing facilities. The supply chain dependencies create a situation where the costs of an offshore wind farm will be highly dependent on the development in other industries. BWEA (2009) argues that the macroeconomics and the development in the onshore wind industry are central when analysing the capital expenditures of offshore wind.

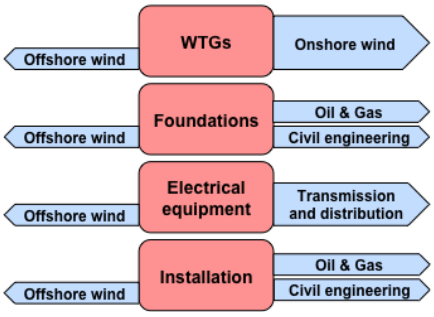


Figure 9 Supply Chain Dependencies. Source: BWEA (2009)

4.3 Projects being planned

There is currently 38 offshore farms with a capacity of 2 074 MW that are generating power with United Kingdom in the lead with 42% of capacity. There is a further 3 238 MW under construction in Europe and the U.K. is once again in the lead with 51% of the capacity. Figure 10 shows the generating and under construction offshore wind capacity per country in Europe. Project pipeline. Source: Compilation from project database (2010)

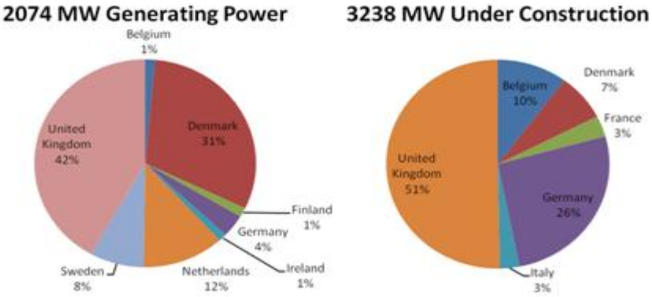


Figure 10 Offshore farms generating power and under construction. Source: Compilation from project database (2010)

When looking at projects in different stages of development there is a great interest in offshore wind. There are 131 GW of projects in different stages, from conceptual planning to installed projects that are already generating power. There is however large uncertainty in these projects and it is uncertain how many projects will actually be commenced. There are on the other hand a sufficient number of proposed projects to reach the EWEA target of 40GW by 2020.

4.4 Key factors affecting offshore wind

This section presents the key factors affecting the offshore wind industry. The factors are presented in the PEST framework, which divides factors into political, economical, social, and technological (Henry, 2008; Presented in Figure 11).

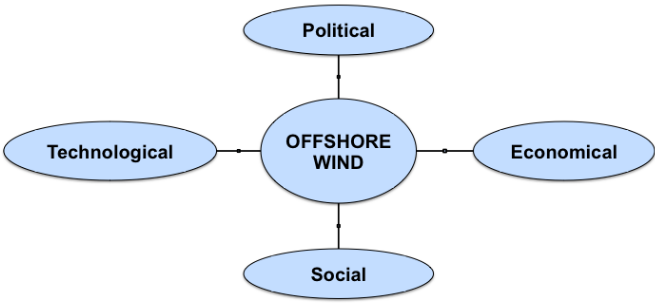


Figure 11 PEST framework (Henry, 2008)

4.4.1 Political factors

Political issues are key influencers for the offshore wind industry since it governs regulations as well as support schemes to the industry. Regulations govern all forms of infrastructure and an offshore wind farm requires construction consent, the ability to sell electricity etc. Support schemes can be either investment support (capital grants, tax exemptions) or operating support (price subsidies, feed-in tariffs, etc.). The operating support is usually the most important to support investments in offshore wind (COM, 2008).

The European energy market was pushed towards renewable sources by the 2001 EU Renewable Electricity Directive, considered to be one of the most important renewable energy legislations passed to date (EWEA, 2010). The development was further pushed by the European Councils 2007 decision to establish a binding target of 20 % of energy from renewable sources by 2020 (EWEA, 2010). National regulations and targets are put in place to reach the EU targets and different measures are taken to push the development. The national regulations vary considerably and will affect how the 20% targets will be reached. United Kingdom has for example imposed significant policies targeting offshore wind as a major contributor to reaching the targets. These policies include spatial planning and development of offshore sites by the Crown Estate in three separate rounds, with projects in the second round currently being developed. Also Germany has strong policies to offshore wind with feed-in tariffs as well as compulsory grid connection by the network companies (EWEA, 2010).

4.4.2 Economical factors

Due to the early stage of the industry development and the limited number of commercial projects, the economics of offshore wind power are uncertain. Figure 12 shows data from projects that are completed and are larger than 60MW. There is a significant variation in the capital expenditures (CAPEX) and the cost does not show signs of a reduction over time, since Horns Rev in 2002 to Thornton Bank in 2009 (BWEA, 2009).

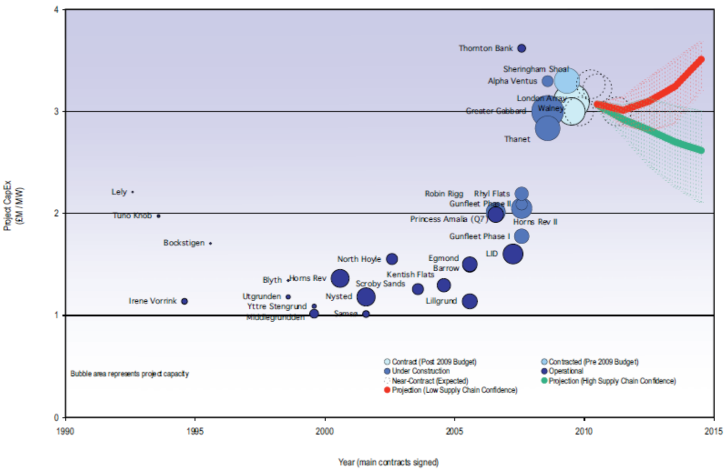


Figure 12 Historical, current and projected capital costs. Source: BWEA (2009)

Figure 13 shows a comparison of the cost structure of an onshore and offshore wind farm project. The cost of individual projects varies significantly depending on factors such as capacity, water depth, distance to shore, etc., but these numbers are an illustration of the difference between onshore and offshore (ODE, 2007). In this case, the cost/capacity is almost 80% higher for the offshore farm, which is similar to numbers provided by EWEA (2009). When looking at specific cost elements it is also clear that the turbines generally have a significantly smaller share of the costs. Instead, foundations and installation work are increasingly important.

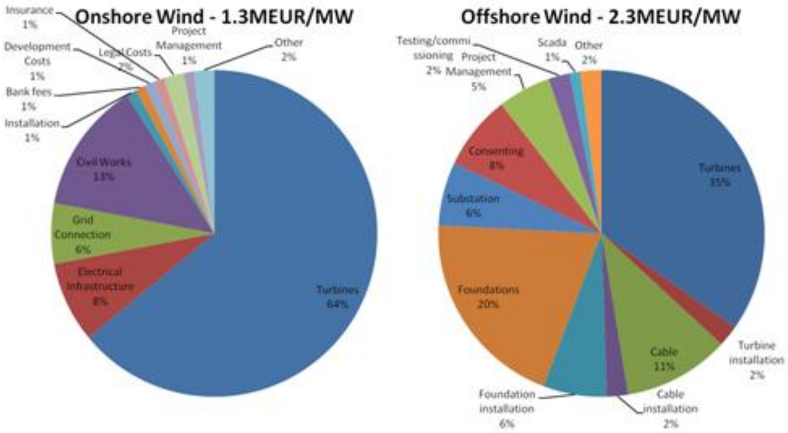


Figure 13 Comparison of cost structure onshore and offshore. Source: ODE (2007)

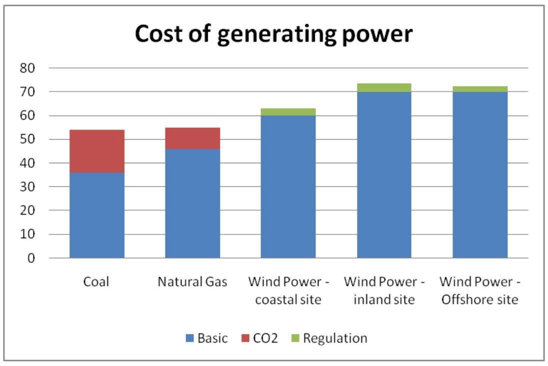


Figure 14 Calculated production cost for different power sources. Source: Derived from EWEA (2009b) and EWEA (2010) data

The cost of electricity produced depends on several factors such as wind conditions, turbine efficiency, capital expenditures, operating and maintenance costs, depreciation rate, feed-in tariffs, etc. Figure 14 presents the calculated cost of electricity produced in selected offshore wind farms. The red fields in the figure represent a calculated (potential) cost for CO2 emissions whereas the green fields represent the cost for regulating fluctuating electricity supply. The numbers can be compared to the costs of generating electricity by competing technologies such as coal, natural gas, and onshore wind power (EWEA, 2009b, and 2010). Generally, offshore wind is more expensive than other sources, including coastal wind sites (on a per kWh basis). This makes it necessary with incentives supporting offshore wind when cheaper alternatives exist.

4.4.3 Social aspects

Social acceptance to wind farms varies depending between countries, demographics and population. In general, the social acceptance often follows the “not in my back yard” syndrome, which has influenced some onshore developments significantly. Social acceptance is an important factor for developers, since complaints may delay the consent process or even put projects on hold, but also social impacts since it is an important influencer for policy makers. However, opinion polls in the Netherlands, Germany, Denmark and the U.K have shown that more than 70 % of the populations want more wind power generation (CA-OWEE, 2001).

Since offshore wind power generally requires subsidies to be financially viable, one can argue that environmental awareness is the main driver of the market. Offshore wind power does on the other hand affect the environment during construction and operation and there is also a risk for a negative local impact near an offshore farm (EWEA, 2010). A farm may impact birds, the landscape, or the marine environment. Since environmental awareness is crucial for the industry, it is also important to show that such local issues are properly taken care of (EWEA, 2010). The visual impact of farms is also an important issue that may affect the feasibility of a project.

4.4.4 Technology

Offshore wind is still in its infancy and there is technological development in several areas that will influence the industry significantly. This may also influence the nature and design of future wind farms and has implications for strategies among firms in the industry.

Offshore wind turbines are currently based on onshore design but there is a development toward designs specifically for offshore. The economics of offshore wind tend to favour large turbines that allow for economies of scale in the installation (EWEA, 2010). Offshore installations are less constrained when it comes to sound level and visibility, while the reliability demands are high to keep maintenance cost low. These factors push the technological development forward.

Foundation is another key part of a wind farm, representing a significant part of the cost in a wind farm, 26% (ODE, 2007; seen in Figure 13). Larger turbines and increased depths create a need for new designs, as the dominating foundation type (monopiles) gets increasingly expensive (EWEA, 2010). The limited number of installations of such foundations creates uncertainty in the economical as well technical performance of the foundations. Current foundations are mainly based on oil and gas designs and novel designs may be introduced specifically for offshore wind. Floating turbines are also being considered for deep-water installations and could potentially allow for large wind energy resources to be harnessed.

Vessels are needed in all phases of an offshore wind farm project. Survey vessels are used in the early phases, installation vessels are used for installing foundations, cables and turbines, while service vessels are used for scheduled maintenance. For large-scale deployment of offshore wind, it is necessary with efficient installation vessels suitable for the conditions and procedures of installing wind turbines. Currently, a limited supply of suitable vessels is available and novel designs will be required for increasing volumes (EWEA, 2009).

The transmission of electricity from the wind farm to the grid is another important component. Most current installations use alternative current (AC) transmission systems, which is generally transformed at an offshore substation. For long distances direct current (DC) is a favourable option that reduces the transmission losses. There is currently only one such installation, namely BorWin 1 located in Germany, and the technology is relatively new. Whether an AC or DC cable is chosen depends on the distance to land and the transmission capacity. Figure 15 shows a simplified model of how the AC/DC cost varies with the distance to shore. Several of the planned projects would require HVDC transmission to be competitive, and diffusion of the technology is important to reach the long term targets in the industry.

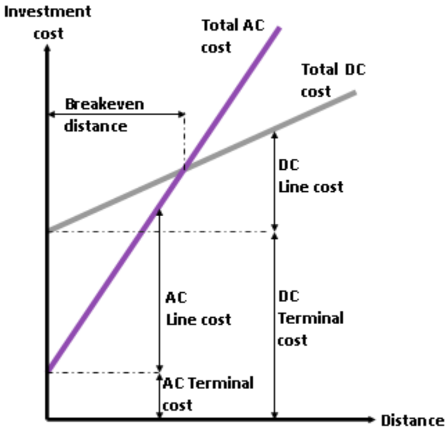


Figure 15 DC vs. AC transmission cost

4.5 Trends in offshore wind

The PEST analysis above has shown several forces affecting the offshore wind industry in different ways. By using the compiled project database identification of some trends in the offshore wind industry has been possible. These trends can affect the nature of the market and how the competition can change in different segments.

4.5.1 Deeper

While the initial projects were constructed in shallow waters, the projects are now moving into deeper waters. Figure 16 shows the average water depth per year for existing projects and the planned projects until 2015. There is a clear trend that offshore projects are moving into deeper waters, which may require new foundation designs and installation solutions.

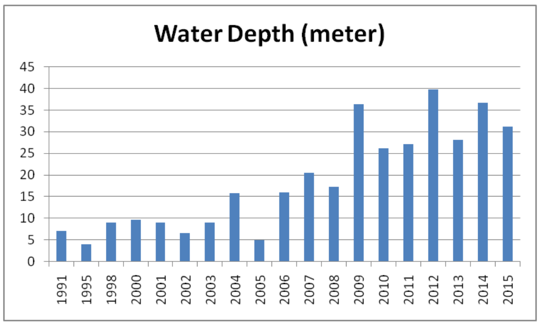


Figure 16 Average water depth. Source: Compilation from project database (2010)

4.5.2 Further offshore

Projects are also moving further and further away from shore. Figure 17 shows the average distance from shore for projects that are planned until 2015. There is a clear trend of increasing distances to shore for the average projects, which will increase the demand for sufficient transmission systems.

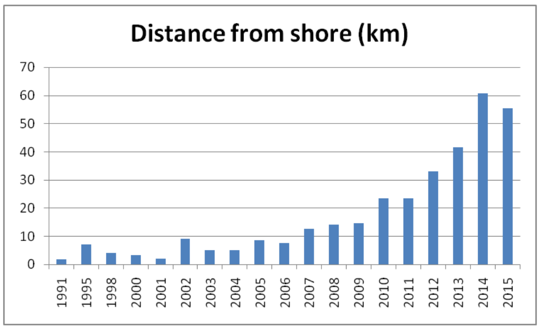


Figure 17 Average distance to shore. Source: Compilation from project database (2010)

4.5.3 Larger parks

Offshore wind farms are also getting larger and larger in the developers drive for economies of scale (Figure 18). Horns Rev 2 was completed in 2009 and is currently the largest offshore wind park with a capacity of 209 MW. Several proposed farms are in the 500-1000MW capacity range.

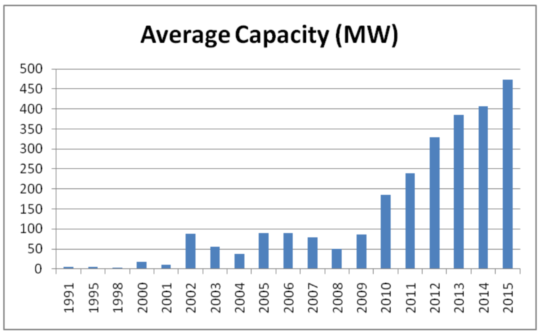


Figure 18 Average capacity of new wind farms. Source: Compilation from project database (2010)

4.5.4 Offshore Transmission Operators – "Plug in the sea"

As offshore wind farms increase in capacity and distance to shore, the transmission of electricity to the grid has become a project in itself, with an offshore transmission owner and operator. In 2009 United Kingdom commenced a new tender process where new Offshore Transmission Owners (OFTOs) bid separately for transmission assets to offshore wind farms. OFTOs will design, finance, own and manage the transmission infrastructure (Ofgem, 2009). The transmission assets required for the three rounds of UK wind farms are expected to be in the range of £15 bn.

The German Infrastructure Planning Acceleration Act passed in 2006 passes the responsibility for transmission to the nearest network owner. Under the new regime, the cost for the grid connection is carried by network operators, rather than by the wind farm owner. The aim is to provide more coordinated network planning to push the offshore wind industry forward (Dena, 2009). Figure 19 shows the difference of the two network approaches; with and without offshore network.

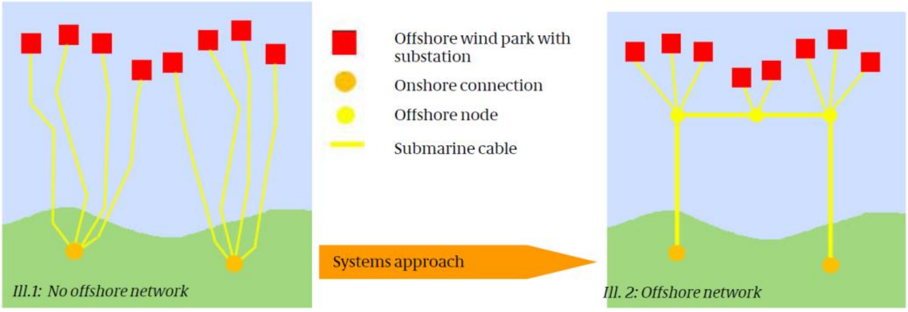


Figure 19 German offshore infrastructure planning approach. Source: Dena (2009)

5 Offshore Wind Industry structure

This chapter presents the industry structure in offshore wind by categorizing firms into different types of actors, and showing the different project contract scopes seen at the market so far. The focus is on "balance of plant" (excluding electrical infrastructure), which concerns the offshore scope of a wind farm besides the turbines.

An offshore wind farm consists of several parts such as turbines, towers, foundations and electrical infrastructure. Each part generally has a supply chain consisting of development, 1st and 2nd (etc.) tier suppliers, installation, and a user/owner. As the industry is relatively new, the boundaries between actors vary significantly between projects. To understand the different actors in broad terms, the main structure of an offshore wind project is described.

5.1 Actor structure in offshore wind farms

The actor structure is shown in Figure 20 and further explained below.

Owners have a financial interest in the wind farm. Ownership could be a pure financial investment or combined with operating the wind farm. Currently, utilities own most of the offshore wind projects, but there is also a potential for individual investors to enter.

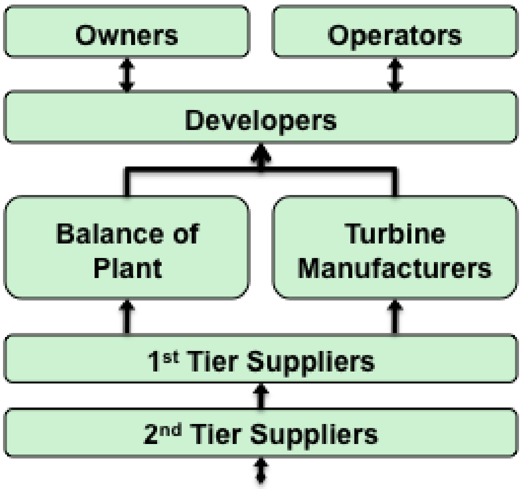


Figure 20 Example of project structure

Operators are firms operating and maintaining the wind farm once it is constructed. The operator is often owned and managed by the owner, but can also be an independent company that is paid by the owner for operating the plant.

Developers are firms that take an initial idea of a wind farm through consenting, financing, construction, early operation (or smaller parts of this scope) and generally sell the project to the owners. There are firms specializing in development, but owners could also have their own development team.

Turbine manufacturers have a key role since the turbine generally is the largest cost item in a farm. Firms generally design and assemble turbines from sourced components.

Balance of plant includes foundations, electrical infrastructure as well as access roads etc. These activities can be managed as a whole or split between contractors.

Suppliers provide components or services such as gearboxes, generators, towers, foundations and transformers. 1st tier suppliers supply to turbine manufacturers or balance of plant contractors while whereas 2nd tier supplier supply components or parts to other 1st tier suppliers.

5.2 Contract types

There are different ways of contracting wind farms and some of the simplified contract structures are shown in Figure 21.

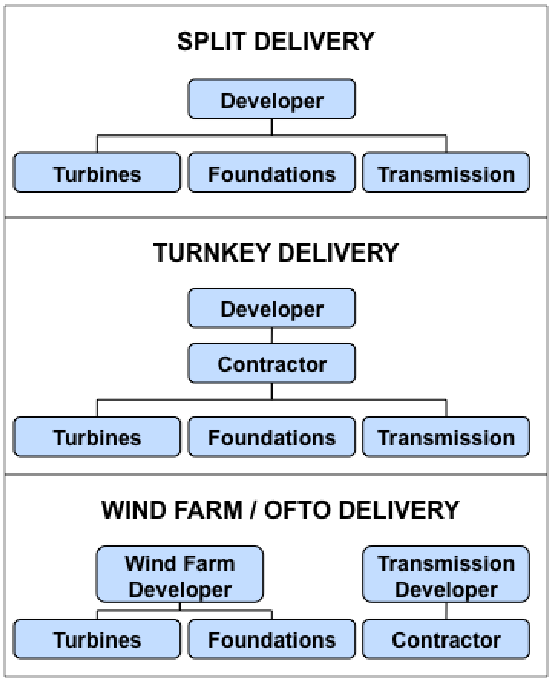


Figure 21 Different contract structures

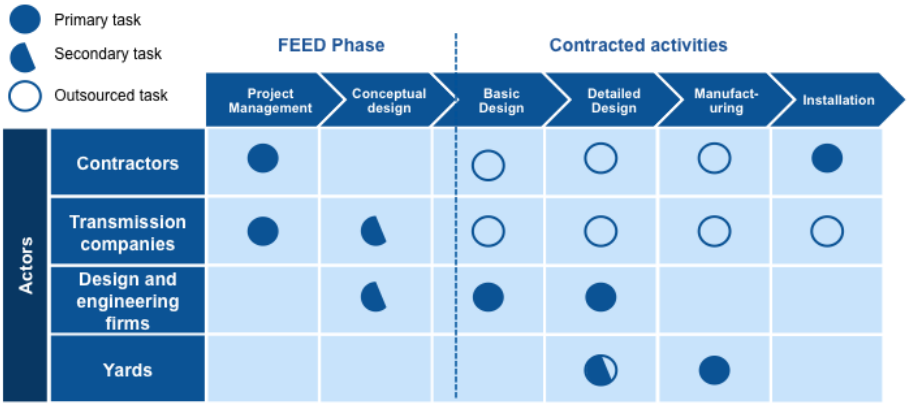
In a split delivery, the contract is split into several contracts between different suppliers /contractors. The benefit for the developer is the ability to choose the right supplier for each specific part. The negative part is that the developers have to manage the interfaces between components, and hence take the risk in case of problems. This requires a lot of knowledge for the developer and increases his scope.

In a turnkey contract, the contractor takes on the task to deliver a complete wind farm, as specified by the developer. The contractor in turn splits the contract to different subcontractors and suppliers. In this case, the interface risk is shifted to the contractor. A few offshore wind projects have been executed as turnkey contracts, with varying results. However, it is difficult to find a contractor that is willing to take on the risk of such a contract.

The wind farm / OFTO structure separates the transmission project from the wind farm. This is an increasingly accepted structure with similarities to how grids are managed onshore. BorWin 1 is an example of a German offshore transmission link that is part of the national grid, and hence, separated from the wind farm. The wind farm can in turn be contracted with either split delivery or a turnkey contract.

5.3 The value chain from a design perspective

To understand the structure of the industry, the value chain activities are shown in Figure 22. The figure describes the actors involved in different design stages, and their main and secondary scope. The model is simplified to include the main activities in each stage. Another simplification is that the boundaries between the activities vary from project to project. The design phases are specified as three different stages from conceptual design, to basic and finally detailed design. Project management is a support activity to all other stages, but is put as the first step in the model for simplicity.



● Primary task
◖ Secondary task
○ Outsourced task

Actors		FEED Phase		Contracted activities			
		Project Management	Conceptual design	Basic Design	Detailed Design	Manufact-uring	Installation
	Contractors	●		○	○	○	●
	Transmission companies	●	◖	○	○	○	○
	Design and engineering firms		◖	●	●		
	Yards				◕	●	

Figure 22 Simplified value chain from a design perspective. Source: Compilation from project database (2010)

5.3.1 Front end engineering design (FEED) or contracted activities

An important distinction linking the value chain to the contract structure is the distinction that can be made between front end engineering design (FEED), generally performed by the developer together with consultancies, and contracted services. The FEED includes the first stages of the value chain such as planning, environmental impact analysis, conceptual designs of a wind farm as well as large components (such as foundations and substations). When a FEED is completed, the project generally goes through a tendering process where contractors bid to supply products and services in compliance with the FEED design.

5.3.2 Actors involved in the design phases of a project

Actors are categorised into four different types; contractors, transmission companies, design and engineering firms and yards. There are also a number of suppliers involved as well as integrated actors performing the tasks of several actors.

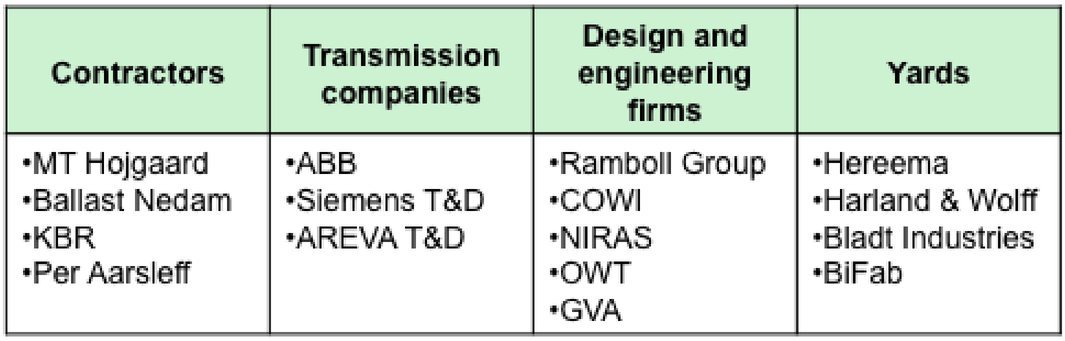
Contractors are responsible for the construction, supply of materials, project management as well as execution of a structure. The contractors generally subcontract part of the work to other firms that specialize in these types of work. In offshore wind, EPC contracts are common where engineering, procurement and construction are included, or EPCI contracts that also include installation of foundations and transmission.

Transmission companies are the suppliers of offshore transmission solutions. They are both suppliers of electrical components (such as cables, transformers, etc.) but also take on project management tasks and may provide turnkey contracts for transmission projects.

Design and engineering firms have specialized capabilities in design of offshore structures such as substations or foundations. They are generally sub-contractors in projects and sell either consultancy services or license design work. GVA belongs to this category of actors but has limited experience in offshore wind compared to the other actors.

Yards are the manufacturers of foundations and/or substations. They generally use facilities that are used for shipbuilding or for general steel construction on a piece-by-piece basis. If the offshore wind industry grows substantially, there may be a need for dedicated facilities for substructures such as monopiles.

Figure 23 shows examples of firms within each category of actors.



Contractors	Transmission companies	Design and engineering firms	Yards
•MT Hojgaard •Ballast Nedam •KBR •Per Aarsleff	•ABB •Siemens T&D •AREVA T&D	•Ramboll Group •COWI •NIRAS •OWT •GVA	•Hereema •Harland & Wolff •Bladt Industries •BiFab

Figure 23 Examples of firms within each actor type

6 GVA and their involvement in offshore wind

This chapter describes GVA's resources and capabilities. This is to provide an understanding of the firm to further anchor the deeper analysis of the opportunity to enter the offshore wind market in the next chapters.

GVA is mainly involved in projects within the oil and gas industry, more precisely in the design phases of different offshore structures and platforms. The process of building a platform or similar is long and firms are highly specialized within this part of the industry.

GVA's design focus lies within conceptual designs, basic designs for semi-submersibles and other vessels but also basic designs for conversion or upgrading projects. Their objective is "…to provide the offshore industry with excellent engineering services – Basic Designs for Semis[2], Drill ships[3] and FPSO's[4] - to the agreed time and price – without compromising our safety, quality and environmental policies" (GVA Company presentation, 2010).

6.1 Core competence

During GVA's involvement in marine and offshore projects for more than 20 years, they have developed specialized knowledge in naval architectures, structural designs as well as marine and drilling systems (Fagerström, 2010). This includes both for new-builds and upgrades/conversion of existing vessels. GVA also provides customers with experience and competence during the whole process of procuring, building or upgrading a vessel. This implies a need for a broad understanding of the whole process and deep familiarity in engineering issues regarding for example safety and certification (Kroon, 2010).

GVA aims to provide customers with floating designs that minimize motions to maximize operation time when vessel is in operation. Their specialty is within buoyant hulls that meet extremely high stability and safety requirements (Fagerström, 2010). Enhanced performance in weight reductions and optimized solutions are in focus, due to otherwise high downtime and maintenance costs. GVA designs are intended to be flexible, for example if upgrades/conversions are wanted in the future (Sandung, 2010). Also, GVA technology has been used in several projects and GVA vessels are known for having high utilization rates.

6.2 Involvement in offshore wind projects

GVA has some experience of working in offshore wind projects. They have assisted their mother company KBR with issues regarding design of topsides and safety requirements.

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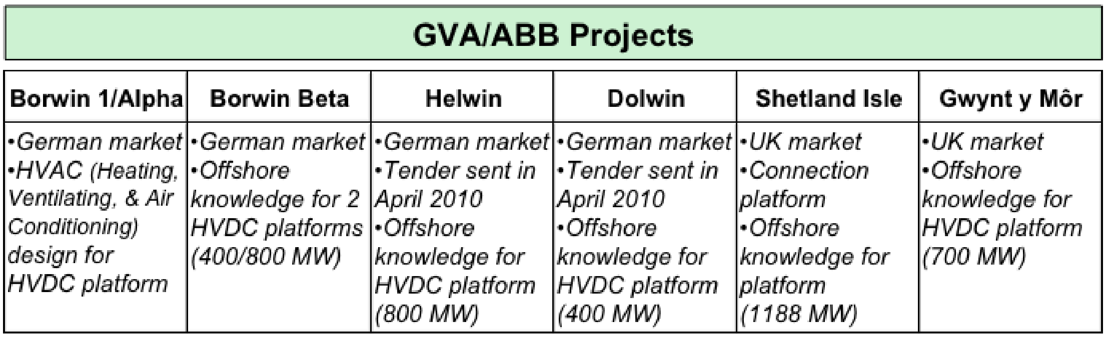
[2] Semis or Semi-submersibles are marine vessels mainly used in the offshore industry for drilling rigs, oil production platforms or similar. The vessels have extremely good stability and are designed to handle rough sea conditions.

[3] Drill ships are equipped with drilling units and used to drill for new oil and gas resources.

[4] FPSO stands for Floating Production, Storage and Offloading and are used for storage and processing of extracted oil and gas before transferred to a tanker or pipeline.

All other projects have been as consultants for ABB in their offshore wind projects and upcoming tenders (Sandung, 2010). As a large transmission and distribution company, ABB is an important actor within electrical equipment supplied to offshore wind farms. ABB delivers both parts to turbines manufacturers and electrical infrastructure, such as cables and transformers. GVA has supported ABB in issues regarding offshore characteristics, basic design of substations and concerns about safety (Sandung, 2010). The specific projects in which GVA has been involved are shown in Figure 24 (GVA Internal Documents, 2010).



GVA/ABB Projects

Borwin 1/Alpha	Borwin Beta	Helwin	Dolwin	Shetland Isle	Gwynt y Môr
•German market •HVAC (Heating, Ventilating, & Air Conditioning) design for HVDC platform	•German market •Offshore knowledge for 2 HVDC platforms (400/800 MW)	•German market •Tender sent in April 2010 •Offshore knowledge for HVDC platform (800 MW)	•German market •Tender sent in April 2010 •Offshore knowledge for HVDC platform (400 MW)	•UK market •Connection platform •Offshore knowledge for platform (1188 MW)	•UK market •Offshore knowledge for HVDC platform (700 MW)

Figure 24 GVA/ABB projects in offshore wind. Source: GVA Internal Documents (2010)

GVA is also currently discussing a development project with ABB. The objective is to design two standardized rig configurations, one small and one large substation, for future projects (Sandung, 2010). There are also discussions of projects including self-installing platforms, this means that the substation can be towed in place and then lifted up without heavy lifting vessels.

6.3 Organizational structure

The GVA office is located in Gothenburg, Sweden and consists of around 130 employees, mainly engineers. Additionally, GVA employ many integrated consultants from nearby engineering firms and subcontractors. The business is divided into seven divisions with front-end competence within each area (see Figure 25). Furthermore, project management functions, administration, human resources, IT services, sales and marketing support the technical divisions in delivering products and services.

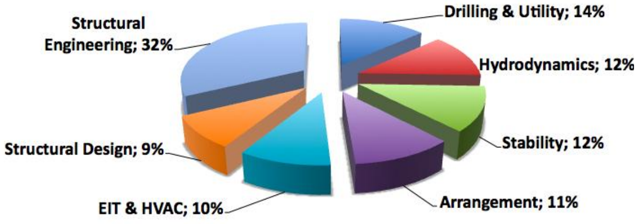


Figure 25 Competence areas in GVA. Source: GVA internal documents (2010)

6.4 Financial resources

As a small firm, GVA cannot be seen as financially strong if compared to the customers or potential clients, either in the oil and gas or offshore wind businesses. However, GVA has strong support from the mother company KBR and can with their support accept and handle larger risks and financial amounts. GVA's revenue is based on two main income parts; margins on sold engineering hours and licenses. Licenses are charged every time a customer uses a GVA design when building a vessel.

6.5 Market position and customer relationships

Compared to customers and cooperation partners, GVA is a very small and specialized firm. Nevertheless, GVA has a strong and unique position within its niche; design of floating units in the oil and gas market. Within design of production semi-submersibles (about 17 large projects) GVA estimate their market share to 53 %[5]. Out of the 200 drill semi-submersibles GVA has been involved in 17 projects, which makes the market share 15 %. Besides this GVA has been a part of many other projects as a consultant in certification, safety and design issues.

The type of business means a strong focus on products and experience. But when customers tender projects GVA must also develop an understanding of what the customer actually wants by keeping close relationships. Figure 26 shows some clients GVA is working with.

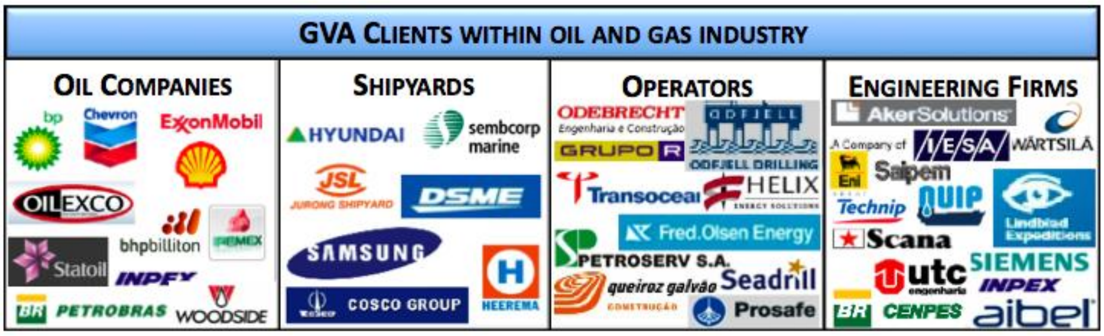


Figure 26 Examples of GVA clients in oil and gas

6.5.1 KBR – The mother company

GVA's owner, KBR, is a large EPC (engineering, procurement and construction) contractor mainly within civil infrastructure, energy and chemicals, government services and ventures. The whole organization employs 65 000 people globally and operations are worldwide. KBR's EPC services include different kinds of feasibility studies, project management, FEED (front end engineering and design) studies but also support and construction. Within offshore wind, KBR has the competence to conduct wind farm FEED studies and developing design solutions for structure, construction and installation of wind turbine foundations (Heaton, 2010). But also, to take on broader EPC contracts where focus is to manage the project, risks involved and sub-contract some of the parts to other firms.

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[5] All market shares have been calculated by compiling of all platforms built and divided by the ones GVA has designed. Since the market for these platforms are limited (only 17 are built or under construction), estimations are considered very reliable.

7 Finding and prioritizing new opportunities in offshore wind

This chapter analyzes the opportunity for GVA in the offshore wind market. It is based in the theoretical framework and built upon on facts regarding the offshore wind market, industry structure and GVA resources and capabilities presented earlier. This analysis derives segments, which GVA can enter by utilizing the existing resources and capabilities and with limited investment.

An interesting opportunity has emerged for GVA in the offshore wind industry, which has strong similarities and synergies to the oil and gas industry. In order to adapt to the changing external environment, GVA needs to enhance its position by understanding changing customer needs as well as new opportunities and adjust its offering accordingly. This will be critical for the long-term performance of the firm.

While the market outlook looks favourable for offshore wind with a strong project pipeline, large scale offshore wind projects still needs to prove its' financial feasibility. Scale economics are yet to be seen in actual projects. While there is a strong demand for renewable energy, there is still risk that offshore development may be substituted by onshore wind or other renewable technologies.

The offshore wind industry is in an early emerging stage with a limited number of installations but strong growth prospects and targets. This analysis has shown that there are several technologies competing in the major parts of a wind farm (turbines, foundations, transmission). Hence, there is a potential to gain strong market shares, if the right technology is chosen. There is on the other hand also a risk of focusing on “wrong” technologies that are marginalized in the market.

Generally, there is a trend towards more standardization and price competition when an industry matures. In the offshore wind industry, certain standardization has already taken place driven by the high capital expenditures early on in the projects. This has pushed lenders and financiers to reduce the risks in the projects, by demanding standards.

Another challenge is the non-existing specific supply chain for offshore wind. In the early stages of industry evolution, high uncertainties in technology and market make actors reluctant to invest in specialized facilities. Current manufacturing and installation capabilities within balance of plant (excluding electrical equipment) currently belong to the oil and gas industry, and there is a limited capacity to reach the targeted diffusion of the technology. The confidence in the supply chain is important for actors to invest in capacity in all stages of the value chain, which is critical for the growth of the industry.

7.1 Potential segments for GVA

Having identified an attractive market opportunity in the offshore wind industry, the next step is to match this opportunity with the resources and capabilities available within GVA. The firm's specialized knowledge in the early design phases, its background and experience in the oil and gas industry makes certain segments of the market more attractive than others. For GVA to find the sweetest spot the opportunity must not only be matched with capabilities but also commitment.

Within balance of plant (excluding electrical infrastructure) there are two products that require significant design work, namely substations and foundations. Since design is GVA's core competence these segments are seen as the best fit with regard to firm capabilities.

The offshore substation market requires design capabilities, knowledge about offshore regulations and an understanding of how the offshore industry works. The design is similar to topsides in the oil and gas industry, but these are generally more advanced than designs for offshore wind. However, an advantage for GVA is that they already are in the substation segment due to their relationship with ABB.

Figure 27 Potential segments for GVA

Also, the foundations and substructures are closely linked to the offshore industry, with several actors present from the oil and gas industry. This minimizes the risk for GVA to enter these segments, and is therefore more easily committed to with the prevailing condition of small investments as presupposition. Additionally, a future segment could be in floating foundations, since this is the best fit with the current core competence. However, this is not in line with the current commitment, but the capability fit is considered to be of such kind that dedication can arise easily if the market develops.

All other segments, like installation, construction or manufacturing, within the offshore wind industry would require large investments and broadened knowledge scope for GVA. This further implies taking on larger risks than GVA currently is committed to.

8 Matching company with new business opportunities

First, each of the derived segments is described in detail by analyzing the industry structure within the segment. Then, each segment is analyzed with Porter's five forces to derive the attractiveness of the segment, in order to quantify the market opportunity. Future scenarios are analyzed to see if GVA fit in the dynamic environment and how capabilities could be utilized in each segment. GVA's strengths, weaknesses, opportunities and threats (SWOT) to enter the market are then described and the situation is analyzed from a broader strategy perspective.

For GVA, dynamic capabilities mean an adjustment of the current business towards the specific requirements in the offshore wind industry. An adjusted business model(s) improves the potential for GVA to achieve a strong market position in the industry, and can create a competitive advantage against competitors. To derive the most appropriate business model the characteristics of each selected opportunity needs to be matched with GVA's capabilities and resources.

8.1 Analysis of the substation segment

As the size of offshore wind farms and their distance from shore increase, there is a rising need for efficient transmission of electricity to shore. This is generally achieved by transforming power to high alternative current (AC) voltages (around 150 KV) or to high voltage direct current (HVDC), and then transporting it to onshore connections. High voltage transformer stations are becoming an essential part of most new offshore wind farms. Such stations consist of electrical equipment (such as transformers) located on a platform close to the windmills. The platform is generally placed on a substructure such as a monopile (as seen in Figure 28 Offshore substation in Rödsand) or a jacket. According to the ODE (2007) study, a complete substation costs around 11MEUR, or around 11 % of total cost of an offshore wind farm. There are currently around 10 installed AC substations and another 14 under construction[6]. A HVDC platform is significantly more expensive, 175MEUR according to The Offshore Valuation Group (2010) and there is currently only one installation under construction, BorWin 1/Alpha.

Figure 28 Offshore substation in Rödsand

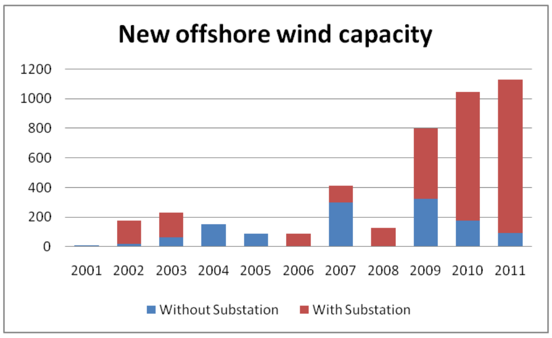

Figure 29 New offshore wind capacity with/without substations. Source: Compilation from project database (2010)

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[6] Data derived from the compiled database.

8.1.1 Current market situation

Most new offshore wind farms require substations to transform the electricity to higher voltages. Figure 29 shows the new offshore capacity (installed and under construction) with/without substations, and it is clear that most new capacity require substations. For new installations, the substation deliveries are expected to correlate with the deliveries of new offshore wind capacity.

Figure 30 shows the number of delivered substations. A significant growth 2009 is seen but the market is still limited in the number of delivered units. The limited production volumes of substations have made most deliveries project based, with a large variety in designs for each project and limited standardization (Drangsholt, 2010). Several actors are calling for more standardization to reduce the costs of the units (EWEA, 2009; Siemens, 2009). Some different designs of delivered substations can be seen in Figure 31.

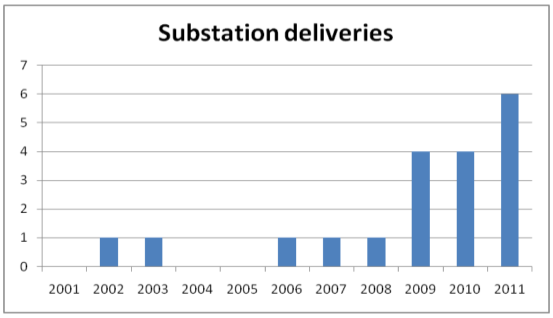

Figure 30 Substation deliveries. Source: Compilation from project database (2010)

Rodsand DK Horns Rev DK Barrow GB Princes Amalia (Q7) NL 2007 Lillegrund SW 2007

Robin Rigg W GB 2008 Alpha Ventus D 2008 Horns Rev 2 DK 2008 Gunfleet GB 2008 Rodsand 2 DK 2009

Figure 31 Delivered Substations

The trend is towards larger and more complex substations (Drangsholt, 2010), where planned substations have dual transformers, are larger than the initial units and have integrated living quarters. Substations for high voltage direct current (HVDC) are usually larger than AC platforms and require more engineering design, due to electrical requirements. The first HVDC platform (BorWin 1/Alpha) is currently being installed by ABB, and GVA was involved as a design consultant in that project. In general, yards, general contractors or transmission companies supply the platforms. However, contractors more commonly supply smaller platforms with a transmission company as supplier. Transmission systems that require more electrical equipment is more often supplied as complete solutions from transmission companies.

Figure 32 shows the development in substation technology. Nysted is one of the early farms with a small (670t) substation, which cost around 10MEUR. Alpha Ventus is the wind farm that is located furthest offshore and placed in deep water to with rougher conditions. It is larger than Nysted (1300t) and has a jacket substructure to support the topsides. BorWind Alpha is the first DC platform installed for a wind farm. It weights 3300t and has significantly more advanced electrical equipment onboard. Global Tech 1 (3000+t) is a self-installing AC platform planned to be located far offshore. It uses a hydraulic jack-up system and does not need a crane vessel to be installed. The design as derived from an offshore oil and gas platform and the intention is to have a standardized platform (Cooke, 2009).

In conclusion, the development is towards more complex and expensive substation platforms, for AC as well as DC installations.

	Nysted	Alpha Ventus	BorWin 1	Global Tech 1
Operating year	2003	2009	2010	2013
Capacity	166MW	60MW	1000MW	400MW
Weight	670t	1300t	3300t	3000+t
Substructure	Concrete	Jacket	Jacket	Self installing
Comment	<10MEUR		HVDC	62MEUR

Figure 32 Development in offshore substations

8.1.2 Market actors

There are several actors involved in the substation segment, at different stages in the value chain. An example is seen in Figure 33 for the Princess Amalia Wind Farm in the Netherlands.

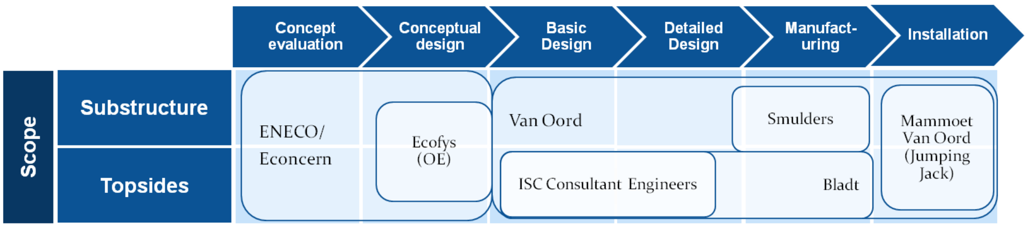

Figure 33 Example of value chain for balance of plant excluding electrical design and equipment for Princess Amalia Wind Farm

Eneco and Econcern were developing the park and managed the first steps in the value chain with the help of “in-house” consultants (Econcern is the holding company of Ecofys). Van Oord Marine and Dredging Contractors received an EPCI (Engineering, Construction, Procurement and Installation) contract for foundations as well as substations. Bladt on the other hand received an EPC contract from Van Oord to supply a substation and contracted ISC consultants for design work. Value chain maps for all other substation projects are attached in appendix C.

The substation contractor is the actor that receives the order from the developer to supply the substation. Figure 34 shows the cumulative market shares among substation contractors and there are yards, contractors as well as transmission companies taking on such contracts[7]. Hence, either a yard (such as Bladt) or for example a transmission company can be contracted by the developer to build the substation.

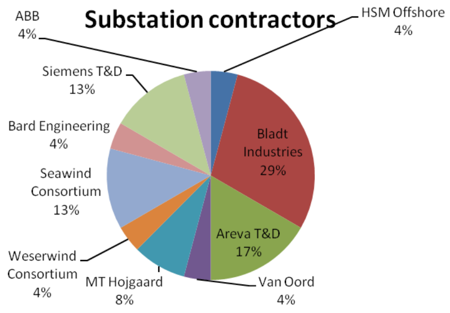

Figure 34 Substation contractors market shares. Source: Compilation from project database (2010)

Figure 35 shows the market shares for substation manufacturing (fabrication). Bladt also has a strong position in manufacturing, with 44 % of the 24 contracted substations. Hereema has been involved in several projects and has an 18 % market share. An important note is that the market shares are for delivered units, not contract value. Hence, Hereema would likely have a larger share in monetary terms since they have manufactured the BorWin 1/Alpha HVDC substation, which is significantly larger than all of Bladt's substations. There are also several new entrants in this segment, having manufactured single platforms.

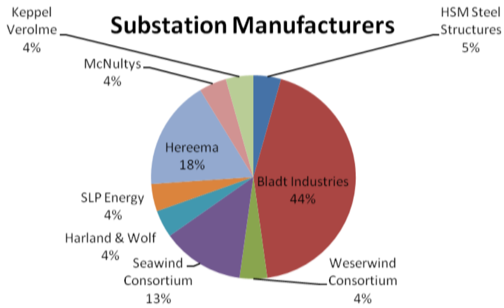

Figure 35 Substation manufacturers market shares. Source: Compilation from project database (2010)

Within substation design (see Figure 36) the market is more fragmented with several consultancies involved. The market shares concern the “main designer” of each platform[8]. The scope of the work differs and it is likely that some projects have been significantly larger than others, resulting in a skewed presentation. As an example, GVA is not included in the pie chart, since the main designer for the BorWin 1/Alpha project was Hereema, while GVA was advising the owner (ABB) on a consultancy basis. As seen in Figure 36there are several firms involved in the design of substations. ISC Consulting Engineers are market leaders and have been working with Bladt on several projects.

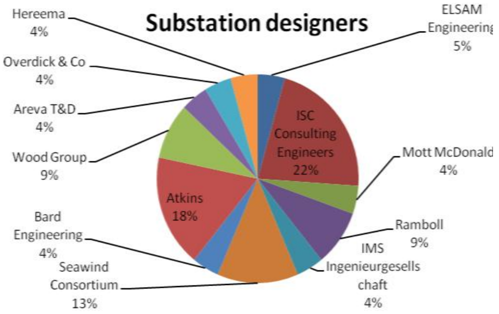

Figure 36 Substation designers market shares. Source: Compilation from project database (2010)

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[7] A comprehensive list of the substations investigated and their value chains can be found in appendix C.

[8] Hence, only one design firm is counted for each of the 24 platforms.

8.1.3 Market attractiveness in the substation segment

Industry Rivalry

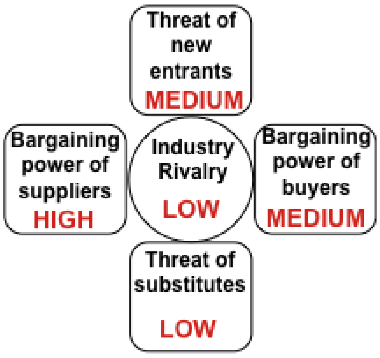

Figure 37 Five forces in substation segment

With a strong underlying growth in the offshore wind industry, and farms moving further offshore, there is a need for more advanced transmission systems. Therefore, it is likely that the substation industry will grow faster than the offshore wind industry. There is a fair amount of competition in the substation industry with 10 actors, which have been contracted to deliver around 24 substations. There is no dominant design yet; instead all stations look different which makes it difficult to compare offerings from companies. This makes price a less important competitive factor and enables firms to differentiate their offering. Substations will likely compete with fabrication of oil and gas platforms, which is a volatile industry with high fixed costs. Altogether, the industry rivalry is considered to be low in the substation segment.

Threat of new entrants

There are a number of oil and gas firms with the capabilities required to supply substations. In general, the technology is less complicated than what is required in oil and gas, which creates a situation with a number of potential entrants. On the other hand, the customers and the underlying industry will be different from the oil and gas industry, which sets new demands on the actors involved. As technology gets more advanced, the ability to patent technology will increase, as seen in for example the Areva MOAB platform. The risk of new entrants is estimated to be medium, with a number of actors with the necessary capabilities available in the oil and gas industry. There are on the other hand a number of consortia being formed to supply complete stations, which creates a barrier for new entrants.

Bargaining power of buyers

The buyer power is considered to be of medium strength. The strong underlying growth is likely to create a situation with limited capacity. The substation represents an important cost item for the buyer. The buyer is therefore motivated to negotiate thoroughly to reduce the cost, as there are a number of potential competitors. On the other hand, each project is different and there is currently a need for customization of each substation. This dependency will likely become more important when substations become more complex. It is unlikely that the customers will integrate backwards to produce the substations themselves. There is on the other hand a risk that they integrate some parts of the business, such as early-stage design.

Threat of substitutes

Substitutes to the substations are alternative solutions that would replace the product. While there is a slight risk of such substitution, the trend is towards high voltage transmission systems with substations. The risk of substitutes is assumed to be limited for AC substations, where there is a clear trend towards higher transmission capacity required. The substitution risk is higher for HVDC systems, which is a novel technology that is yet to prove its economical feasibility. This substitute puts a price cap on the potential value of the HVDC transmission, where the HVDC link should not cost more than the value of the improvement in transmission capability.

Bargaining power of suppliers

The bargaining power of suppliers is considered to be high in the substation industry. The yards are key actors in the value chain and represent a major part of the value that is added. There are a limited number of suppliers available, especially for large substations. Since the yards main focus is other industries, the wind market is currently small compared to their total sales. The fabrication facilities are also designed for small volumes and there is a risk that this may be a bottleneck if the offshore wind industry grows as forecasted. In conclusion, the substation market is an attractive segment due high growth prospects and a limited supply capacity.

8.1.4 Future scenarios in the substation segment

Even though the trend is towards more transmission capacity required, there is still uncertainty in the nature of the demand. A scenario analysis method (Magnusson, 2010) is applied to derive relevant scenarios within the substation segment from a GVA perspective. First, the background and current market situation is used to map connections and retrieve the influencing factors (Magnusson, 2010). That is, surrounding factors, which is of importance for the future development. Then, trends and uncertainties are sketched. Trends are factors with a low uncertainty but large effect on the market development and are used as a base for all scenarios (Magnusson, 2010). Uncertainties have great influence, several outcomes are possible and they make the key difference between the scenarios (Magnusson, 2010). By mapping the most important uncertainties scenarios are derived. Finally, the implications to the firm strategy due to the scenarios are analyzed.

Two key uncertainties that will affect the market and GVA have been found within the substation market; (1) the use of HVDC transmission and (2) the degree of standardization. The use of HVDC transmission is important because several planned projects rely on the technology due to a long distance from shore and a high capacity. Limitations in the diffusion of HVDC would most likely limit the feasibility of several wind farms and reduce the market size. The degree of standardization is important, since it will affect the manufacturing and especially the design of substation, which is of importance for GVA. Whether standardization can take place is dependent upon the number of substation built, pressure from buyers, but most importantly if it is technically possible. This is an important uncertainty, since experts within the offshore wind industry have different opinions regarding the technical feasibility of standardized substations. From these uncertainties, four scenarios are derived, as shown in **Error! Reference source not found.**. hese future scenarios will be described in the following.

“Designers Dream”

A wide use of HVDC transmission and a low degree of standardization is the scenario, where a large expansion of wind power can be reached. EWEA’s target of 40 GW is within reach when an interconnected grid enables a large expansion of offshore wind power. The HVDC market will take off while there is also a strong expansion in far-offshore AC platforms with living quarters. The low degree of standardization creates a situation with a lot of engineering work required for each substation, which is similar to the current situation. GVA has a good position to capture a share of the HVDC market with ABB and also a potential to expand the scope in the AC market.

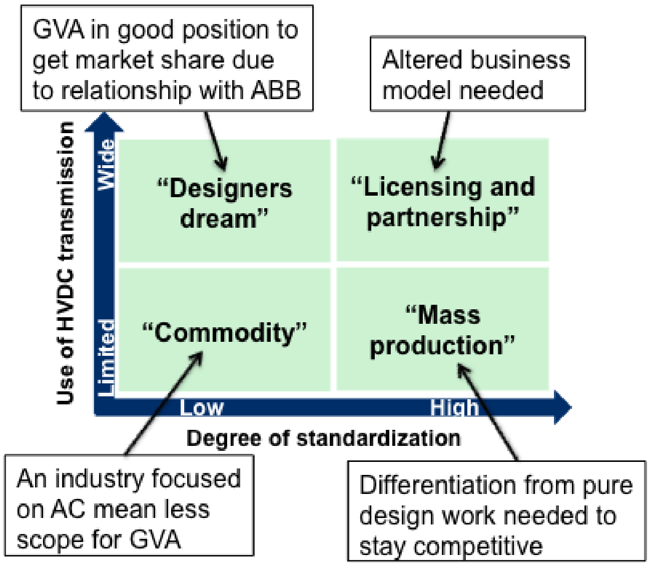

Figure 38 Scenarios for substations

“Licensing and Partnership”

A wide use of HVDC transmission combined with high degree of standardization is a scenario enabling a market growth similar to, or even greater than the “designers dream”. Standardisation would reduce the cost for substations and transmission, which would improve the economics of offshore wind further. For substation suppliers the scenario with standardisation may reduce the margins and call for more streamlined production of AC as well as DC stations. The design firms would be most affected by the standardisation, as the design scope for each unit would be reduced. For GVA it would call for a business model based on licensing and partnerships through standardized designs developed in-house and/or partnerships with yards.

“Commodity”

A scenario with limited use of HVDC transmission and a low degree of standardisation would likely inhibit the growth of the offshore wind industry. With limited international grid integration the potential production would be reduced in several markets. Wind farms would also be limited to areas relatively close to shore to limit transmission losses. The substation industry would be focused on AC platforms and the lack of standardisation would provide a relevant market for design and engineering firms. There would on the other hand be strong competition since several firms would be capable of designing the platforms. GVA’s position would be reduced, as the design of platforms would be “commoditized”.

“Mass production”

In this scenario there is a limited use of HVDC transmission and a high degree of standardisation in substations. With limited international grid integration the potential production would be reduced in several markets.

Wind farms would also be limited to areas relatively close to shore to minimize transmission losses. The high degree of standardisation and the use of more simple AC platforms would reduce the design scope significantly. The yards may be able to handle design themselves and standardise their processes for “mass production” of basic AC platforms. In this scenario, GVA could focus on their relations to yards and customers to differentiate their offering from pure design work.

8.1.5 GVA in the substation segment

As a leading designer of offshore oil rigs, GVA has the technical capabilities required in the offshore wind industry. The firm’s competitive advantage is on the other hand reduced because of the less advanced design scope in wind. The scope is also smaller in wind than in oil and gas projects. A normal basic-design project for GVA spans 35 000 – 50 000 hours, while a large project in offshore wind could be around 10 000 consulting hours. This implies that it may be beneficial to differentiate the customer offering in other ways than through pure design projects.

The scenario analysis above shows how different uncertainties at the substation market can impact the underlying market as well as GVA’s position and strategy. In all scenarios except “Designers dream” there is a limited scope in being an independent design firm. Hence, it may be important to thoroughly analyze potential partners and coalitions to find a suitable role.

GVA’s relation with ABB is of great value since it provides access to several projects where GVA can act as a subcontractor to either ABB or to yards contracted. Hence, it can be a great market channel for GVA that enables the firm to get involved in different projects with limited marketing efforts and investments. There is on the other hand a limitation in the amount of work that is required by ABB and a risk that GVA gets locked into ABB’s way of seeing the market.

There is also a strong potential for GVA to work with KBR to develop a broader offering. Their strong position in the U.K. and the resource base create a potential to serve the substation market with a more complete offering. Since KBR is an EPC firm, there is a possibility for GVA and KBR to together carry out complete substation projects from design to construction and installation. This implies a greater risk than GVA is willing to accept, but in collaboration with KBR the attitude might be different. Also, the strength of KBR as a global and well-recognized firm can help GVA, as a smaller consultancy firm, in winning contracts at other large companies.

8.2 Analysis of the fixed foundation segment

The industry was originally developed by the oil and gas industry to supply a limited number of foundation structures for offshore operations. When oil and gas exploration has moved further offshore, the manufacturing capacity has been reduced due to the use of floating structures instead. A foundation generally consists of a substructure, such as a monopile, jacket or tripod combined with a transition piece that connects the substructure to the turbine tower (see Figure 39).

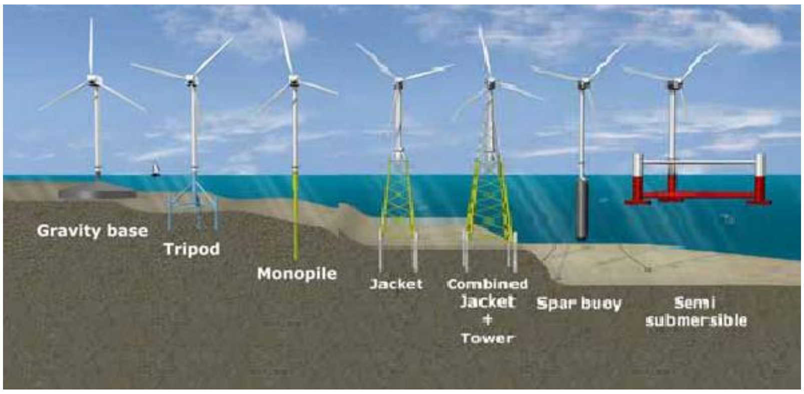

Figure 39 Foundation types. Source: Carbon Trust EWEA (2009)

Foundations are a major cost item in an offshore wind park and represents around 20 % - 34 % of total project cost, which is just slightly less than the cost of turbines (Papalexandrou, 2008). Novel designs and improved manufacturing processes may reduce the costs, which would have important implications for project economics.

8.2.1 Current market situation

The market for substations is directly connected to the number of wind turbines to be installed. With a strong growth in offshore wind capacity, a similarly strong growth in foundations would be required. Keller at Make Consulting (2010) assumes that the average turbine size will increase to around 6.3MW by 2020, which would reduce the number of foundations slightly. But each foundation would on the other hand have to be stronger to support larger wind turbines (Keller, 2010). A long-term forecast on the number of foundation deliveries for the offshore wind industry is a growth of a few percent annually. During 2010, 409 foundations will be delivered, and the number of foundation deliveries is predicted to grow to 1190 foundations in 2020.

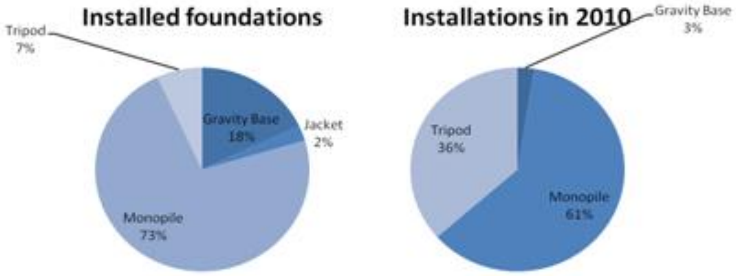

Figure 40 Installed foundation types. Source: Compilation from

Currently, monopiles is by far the most common substructure type with a 73 % share of cumulative installations as seen in Figure 40. In 2010 the shares of tripods (and tripiles) have increased to around 36 % of installations. This is a result of a new deepwater wind farms in Germany (Bard 1). In deep waters the traditional monopile gets costly and alternatives such as tripods or jackets are more competitive. An expansion in deepwater farms would likely change the foundation types being installed.

8.2.2 Market actors

The market is segmented into monopile and other (non-monopile) foundations to understand the different industry structures. The market for supplying monopiles is largely dominated by the contractor MT Hojgaard with a 48 % share. There are also several other actors involved but with smaller share as seen in Figure 41[9].

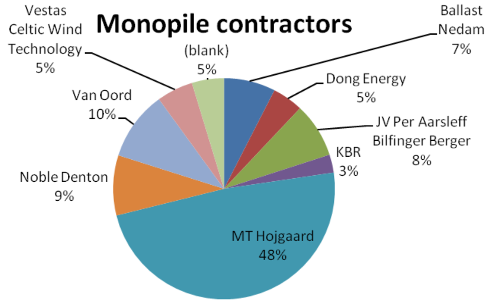

Figure 41 Monopile contractor market shares. Source: Compilation from project

Other foundations include tripods, tripiles, jackets and gravity foundations. The joint venture between Per Aarsleff and Bilfinger Berger has a market share of 40 % and are mainly focused on gravity foundations. BARD engineering has 19 % market share with their BARD 1 Offshore farm under construction and the wind farm Hooksiel. There are also several actors with small shares due to involvement in single projects. (See Non-monopile contractor market shares. Source: Compilation from project database (2010)[9])

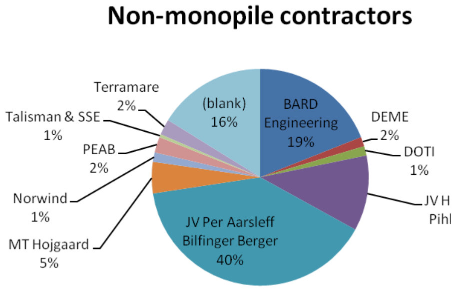

Figure 42 Non-monopile contractor market shares. Source: Compilation from project database (2010)

For fabrication of monopiles Sif/Smulders is the dominating actor. There is however an uncertainty in the market shares due to the large percentage (22%) of installations with unknown supplier. EEW has recently entered the segment as well as a Chinese manufacturer gaining a 12 % market share with only one large order. (See figure Figure 43[9])

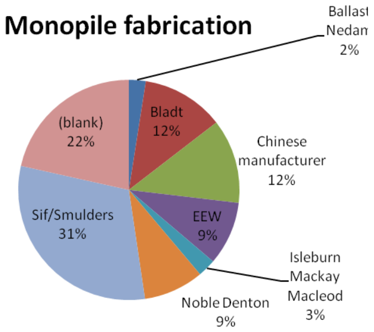

Figure 43 Monopile fabrication market shares. Source: Compilation from project database (2010)

Ramboll is by far the largest designer of monopoles with a 57 % market share. They are generally working in a partnership with MT Hojgaard, which is the dominating contractor. There are several actors with small market shares, and there may also be actors hidden in the "blank" field in Figure 44[9].

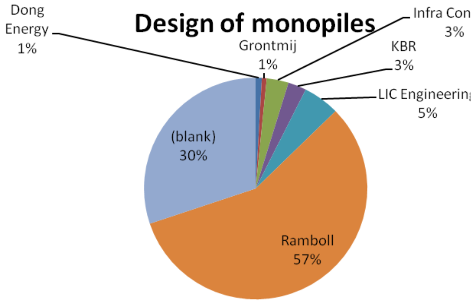

Figure 44 Monopile design market shares. Source: Compilation from project database (2010)

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[9] (blank) means that the supplier(s) has/have not been found.

8.2.3 Market attractiveness of the fixed foundation segment

Industry Rivalry

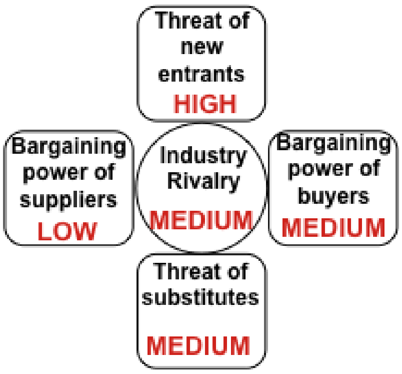


Figure 45 Five forces in fixed foundation segment

There are several actors, which have delivered (or been contracted to deliver) foundations to the wind industry. Market shares change rapidly as deliveries to a single large wind farm are substantial compared to the cumulative installations. However, there is currently a market leader with a very strong market share. Foundations are fairly standardized within monopiles, but there are competing designs as jackets, gravity based and tripods/tripiles. Additionally, the current fabrication capacity is limited compared to what is needed in a high growth offshore wind scenario (EWEA, 2009). Either existing suppliers increase their capacity radically or this opens up space for new entrants.

The market is expected to grow in line with the overall growth in the offshore wind industry. When turbine size increases, the number of foundations will be slightly reduced, and adaptation to withstand the increased weight of turbines is necessary. Also, increasing depths of installations can mean variations in design.

Altogether, the industry rivalry is considered to be of medium degree since there are many actors within this segment, a potential for future gaps in capacity and hence risk of new entrants. Furthermore, customers value experience and knowledge high, which favour the existing suppliers.

Threat of new entrants

The risk of new entrants is estimated to be high in the foundation industry. The recent entry by a Chinese Manufacturer shows that it is possible to ship foundations long distances. This opens up the market for large yards in for example Asia, putting pressure on European manufacturers in terms of reaching economies of scale and stay price competitive.

Taking on a large contract is a significant endeavour that requires a certain company size and financial strength. Another entry barrier is the specialist knowledge needed, due to customers' demands for offshore wind experiences. There are however a great number of civil contractors that could potentially enter the industry, with the help of partners.

Within design, it has been difficult to find the companies involved and also the potential entrants. As every single foundation currently needs individual design, it is difficult to see the economies of scale in the design stage. While proper design work can reduce the cost of the foundations through more efficient material use, experience and previous references will be an important sales argument. There is however standards to follow in the design work (such as DNV) which is a way of "commoditizing" the design.

Bargaining power of buyers

The number of customers, developer/owner of the wind farm, is limited and this increases the bargaining power of the buyer. They generally have access to a lot of information on the foundation business through the use of consultants and generally tender the projects to several suppliers. The cost of foundations is a major cost item for developers, which is not far from the cost of turbines. Hence, developers' are price sensitive and they will attempt to keep the costs of foundations as low as possible since it is of great importance for the economic feasibility of the projects.

The ability to differentiate the product is difficult in foundations, especially in monopiles. There may on the other hand be a possibility to differentiate the complete offering with warranties and service. This has proved to be difficult, especially for the interfaces in different contracts. The uniqueness of a product may create a dependency (or lock-in) to certain suppliers, but it is unlikely to occur in foundations in a broad sense. There may on the other hand be niches where such lock-in may occur; an example is the grouting between foundations and transition piece, where one company (Densit) is supplying most projects.

The ability for customers to produce the products themselves is another consideration. They specialize in consenting, project management and contracting, which is quite different from supplying and installing foundations. There are on the other hand firms taking on an integrated approach that includes parts of the foundation work (i.e. Bard engineering and DONG Energy).

Altogether, the bargaining power of the buyers is considered medium for foundations. It is difficult to differentiate the offering and easy to compare company offerings, but developers are dependent on reliable suppliers to decrease project risks.

Threat of substitutes

The risk of substitutes is expected to be low in limited water depths and higher in deep water. In limited depth waters where monopiles are generally used, a limited risk for substitution by other technologies is seen. In deep water on the other hand, there are several competing designs and it is more uncertain what the future will look like. There are for example self-installing foundations being designed that could reduce the cost of installation significantly. There are also different jacket types, tripods, tripiles, etc. and there is a high uncertainty in how future designs will look. Altogether, there is a medium threat of substitutes.

Bargaining power of suppliers

The suppliers in the foundation industry are yards and other steel fabrication companies, hence yards can be both suppliers and contractors. While there were only three suppliers to offshore wind a couple of years ago, there have been several new entrants the last couple of years. This has reduced the bargaining power of suppliers. Furthermore, the cost of switching between suppliers is considered to be low. However, there is currently a limited capacity to produce foundations, and a need to invest in more efficient fabrication facilities for large volume production (EWEA, 2009).

A large foundation order today may be significantly bigger than previous orders, and often create a need for the supplier to invest in capacity. This increases the bargaining power of the suppliers. The growth in wind farm size may in fact increase the bargaining power of suppliers. However, it is relatively easy to compare offering and a number of firms with the capabilities to fabricate foundations. On the other hand, the market is growing and there is a need for new manufacturing capacity to be installed. Therefore, the power of suppliers is considered to be low in the foundation industry. In conclusion, the foundation industry is attractive if economies of scale can be reached to create a cost advantage.

8.2.4 Future scenarios in the fixed foundation segment

As the foundation market within monopiles matures the uncertainty factors decrease in importance, since the industry has accepted this kind of foundation as one of the early dominant designs. Even though there are competing designs, such as tripods and jackets, these will rather complement monopiles on greater depths as it is today.

The possibility that monopiles can become economically feasible even in deeper waters can increase the competition significantly, but this is yet to see. Also, it could be the other way around that other designs become economically feasible to use in more shallow waters. This could drastically change the market structure and competition, since actors within monopile manufacturing and tripods/jackets fabrication are different firms. Then again, this is not considered probable due to the amount of well functioning monopiles and the strong predicted growth in the market. However, there will always be an overlap in projects and depth, where either monopiles or jackets/tripods are as favourable, in which competition is fierce.

Within monopiles, the trend in development is towards high volume production, since pricing and cost is important to keep customers and profitability. This benefits existing suppliers, due to their prior knowledge and learnings in production. Still, it is not certain that existing manufacturers want to or can handle the predicted market growth.

8.2.5 GVA in the fixed foundation segment

The foundation market is large, both in volume and value, and the products are considered stable. GVA has experience within offshore wind and relationships from the oil and gas business that could be used to enter the market. This results in lower entry barriers for GVA. Another advantage is that variation in design for each foundation location is needed, which implies an indefinite stream of re-design projects. Also, changes in design due to increased water depths opens up the market for entrants and broaden the competence needed within the market. However, the industry is highly competitive and the design scope is very small part of the complete contract of designing, manufacturing and installing.

More importantly is that foundation design is more within KBR’s project scope than GVA. This complicates the situation since competition within a corporate group should be avoided. GVA's core competence is within hull structures, and the design is usually a larger part of the full contract in the oil and gas industry (such as for oil production platforms). This means that GVA's competence may be too advanced and expensive for designing foundations. Since, even well equipped yards can do the design in the same contract as the manufacturing. These two factors, KBR/GVA competence and the current scope, strongly affect the attractiveness of the opportunity for GVA to enter the foundation market.

8.3 Analysis of the floating foundation segment

Only a few floating foundation projects exist, consequently there is not market for theses foundations today. However, harnessing of wind at very deep offshore wind farms location can open up the market and make it economically beneficial. This is due to the cost of fixed foundations increases exponentially with the water depth, when more steel is needed and installations become more complex. Possible areas in Europe include along the Norwegian coast, the Atlantic Ocean but also in the Mediterranean Sea.

8.3.1 Current market situation

One major driving force is the possible increased utilization rate due to high wind spots at deeper locations, which enable projects with the same return as the equivalent farms near-shore. Another advantage is that less adjustment of the design at each location is needed and this enables easier standardization than with fixed foundations. This implies easier economies of scale in production in the long run. Also, less steel is needed, assembly can be made onshore and the use of offshore installation vessels can be minimized (EWEA, 2010).

Although the development of floating foundations is in a very early phase and many challenges lie ahead. A wide range of technical problems, such as the long-term sustainability of constantly moving windmills, needs to be solved before floating wind turbines can be commercialized (EWEA, 2010). Technical challenges can probably be overcome but is costly and require a lot of R&D. Also, economics around the projects are highly uncertain since no lifespan can be guaranteed or accounted for, and investments are considerably large. Many other challenges also complicate the development of floating turbines, where some are shown in Figure 46.

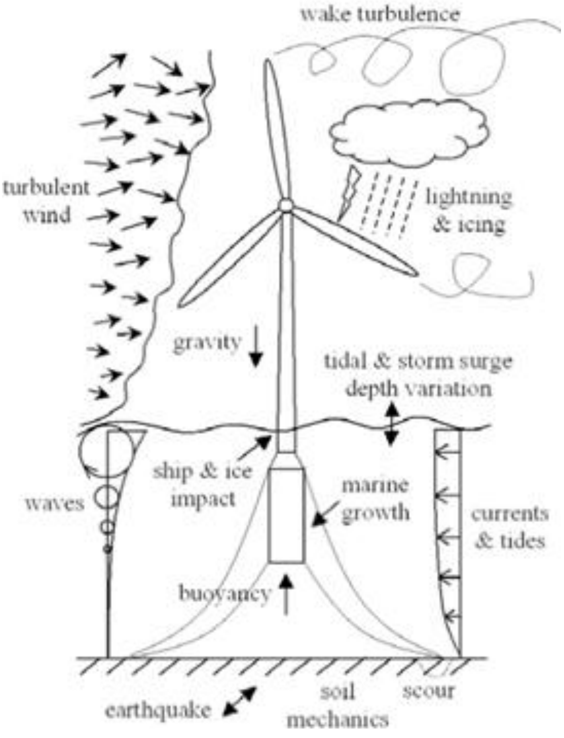
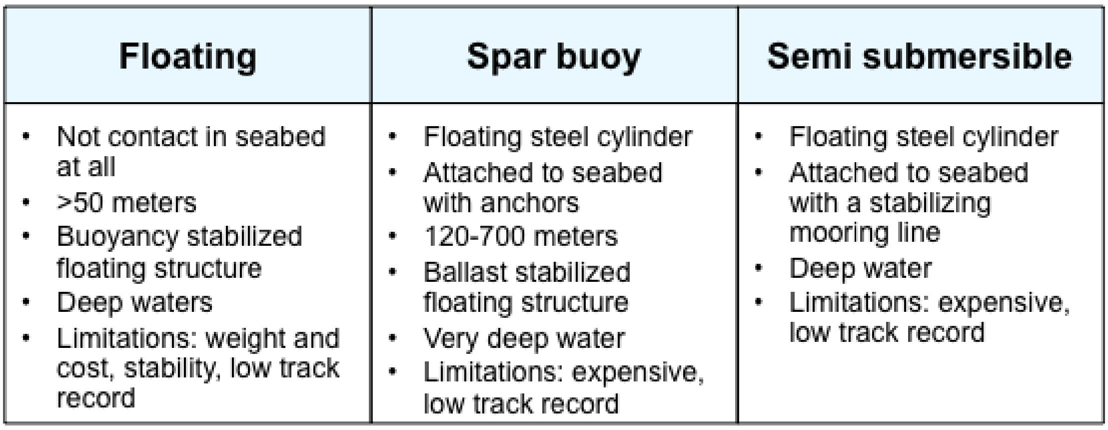


Figure 46 Environment for floating foundations

According to EWEA (2009a), there are three main kinds of floating concepts (see Figure 47). All of them have low track record and no dominant design has emerged. These are all one turbine per foundations, but others have also suggested so-called multiple turbine floaters where several turbines share the same foundation (see appendix D for some of the developed concepts so far).

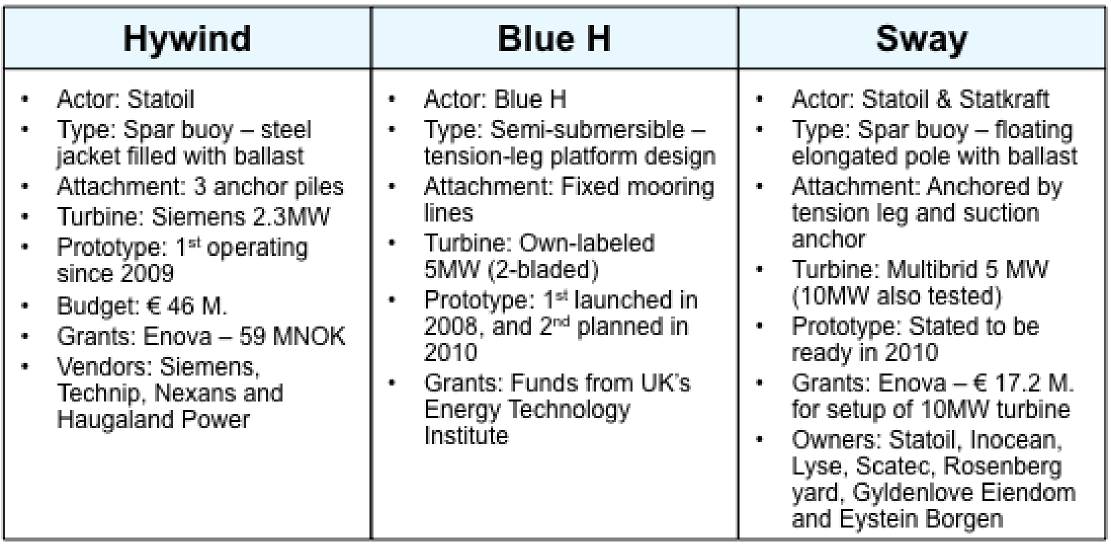


Floating	Spar buoy	Semi submersible
• Not contact in seabed at all • >50 meters • Buoyancy stabilized floating structure • Deep waters • Limitations: weight and cost, stability, low track record	• Floating steel cylinder • Attached to seabed with anchors • 120-700 meters • Ballast stabilized floating structure • Very deep water • Limitations: expensive, low track record	• Floating steel cylinder • Attached to seabed with a stabilizing mooring line • Deep water • Limitations: expensive, low track record

Figure 47 Types of floating foundations. Source: EWEA (2009)

8.3.2 Market actors & projects

There are only three floating foundations ongoing in Europe, and all these are single turbine foundations. A summary of the actors and other data for the three projects are shown in Figure 48**Error! Reference source not found.**.



Hywind	Blue H	Sway
• Actor: Statoil • Type: Spar buoy – steel jacket filled with ballast • Attachment: 3 anchor piles • Turbine: Siemens 2.3MW • Prototype: 1st operating since 2009 • Budget: € 46 M. • Grants: Enova – 59 MNOK • Vendors: Siemens, Technip, Nexans and Haugaland Power	• Actor: Blue H • Type: Semi-submersible – tension-leg platform design • Attachment: Fixed mooring lines • Turbine: Own-labeled 5MW (2-bladed) • Prototype: 1st launched in 2008, and 2nd planned in 2010 • Grants: Funds from UK's Energy Technology Institute	• Actor: Statoil & Statkraft • Type: Spar buoy – floating elongated pole with ballast • Attachment: Anchored by tension leg and suction anchor • Turbine: Multibrid 5 MW (10MW also tested) • Prototype: Stated to be ready in 2010 • Grants: Enova – € 17.2 M. for setup of 10MW turbine • Owners: Statoil, Inocean, Lyse, Scatec, Rosenberg yard, Gyldenlove Eiendom and Eystein Borgen

Figure 48 Actors in floating foundations. Source: Own compilation (2010)

8.3.3 Market attractiveness of the floating foundation segment

Floating foundations for turbines is still an emerging concept with large uncertainties regarding the feasibility, both from a technological and financial perspective. Nevertheless, it is an opportunity for new firms to enter and affect the way the market emerges. The existing prototypes have been launched, and the offshore wind market is keen to see how the development progresses. So far, the projects are financed through grants, venture capital and R&D investments in large firms. Together with the non-existing demand, this implies the very emergent stage and risk-taking needed from actors involved. But also, the great potential to develop a new design which possibly could create a demand and become market leader.

Existing projects have had different developer structures. Blue H is a small privately financed firm, while a consortium consisting of several actors owns Sway. Hywind was developed by Statoil, which is a large and financially strong firm in contradiction to the firms developing Blue H. This implies the interest from many kinds of actors, and hence the belief that the technology is feasible and can become economically viable.

For firms with competence within this area, the opportunity to be part of the development is obvious but with high risks. Ways to minimize risks could be to enter partnerships with other firms, financing with grants or funds, bootstrapping projects, R&D collaboration with universities but also acting as a supplier to another already initiated project.

8.3.4 Future scenarios in the floating foundation segment

Currently, three designs are available as prototypes. One of these could become the leading design but it could as well appear new concepts that win the dominant design war. Or, the projects could be abandoned and ideas about floating foundations completely disappear.

The technology is foremost aimed to deepwater locations, but in the long run floating foundations could compete with fixed foundations in more shallow waters too. This would not only mean a new market for floating foundation, but also competing at another market. Therefore, one of the key factors for the future potential market size, if the emerging technology succeeds, is whether all new farms will have floating foundations or only at deep locations.

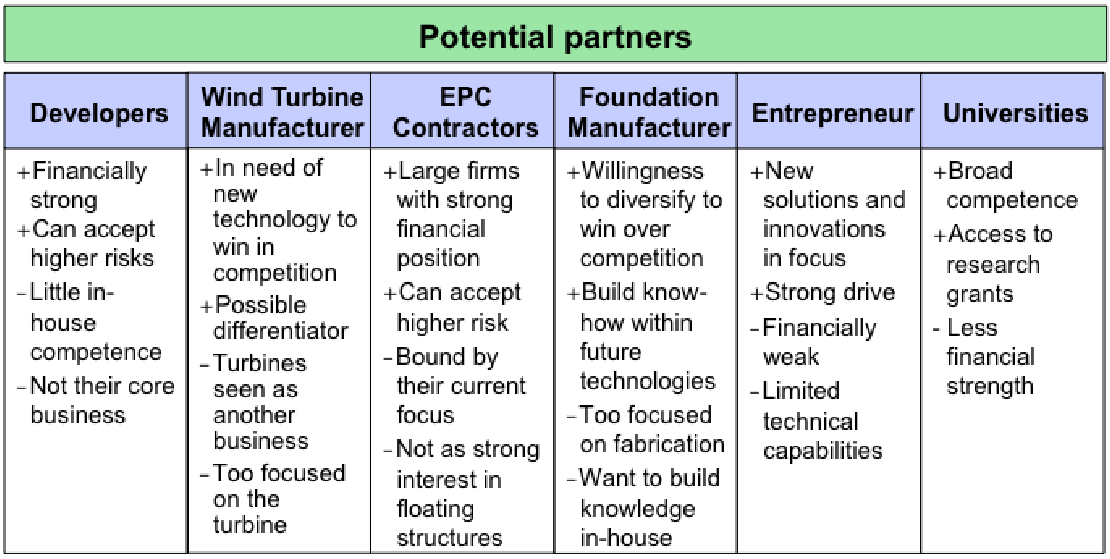
The future market size set the scene for the number of actors that can trade at the new market, the possibilities to reach economies of scale, and the consequences for the offshore wind market as a whole. For example, the industry would need less installation vessels and a diminishing demand for monopiles could arise. However, if the market is limited to great depths the market for floating can become a niche market compared to the fixed foundation market.

8.3.5 GVA in floating foundation segment

GVA competence is well fit with designing floating foundations, since it consist of a kind of hull with a mounted windmill on top. Although, the structure will somewhat differ in shape and build-up the underlying knowledge needed is very similar to GVA’s current specialization. However, the emerging state of the market means that investments from GVA are required and the risk is high. Instead of having a pull from the customers for competence and knowledge, GVA would need to push the floating foundations technology to become a market. Even though this could mean a leading market position, if the market emerges, the resources and capabilities required to get there is immense.

Nevertheless, there can be other alternatives to become a part of this development without having to take the risks alone. By entering partnerships with other firms that are interested to develop concepts for floating foundations, GVA could gain experience to prepare for being a part of the potentially large future market. This would also demand a dedication from GVA but a lot less in terms of resources and with a lower risk. Besides, partnerships are necessary whatsoever in development since broad competence within many areas is needed. But it can be very difficult to initiate collaborations, if GVA does not what to be the leader of the projects.

There are a number of potential actors, which could be GVA's partners in floating foundation projects. Figure 49 below maps the pros and cons for GVA to cooperate with existing actors within the offshore wind business, but also some possible external actors.



Potential partners					
Developers	**Wind Turbine Manufacturer**	**EPC Contractors**	**Foundation Manufacturer**	**Entrepreneur**	**Universities**
+Financially strong +Can accept higher risks -Little in-house competence -Not their core business	+In need of new technology to win in competition +Possible differentiator -Turbines seen as another business -Too focused on the turbine	+Large firms with strong financial position +Can accept higher risk -Bound by their current focus -Not as strong interest in floating structures	+Willingness to diversify to win over competition +Build know-how within future technologies -Too focused on fabrication -Want to build knowledge in-house	+New solutions and innovations in focus +Strong drive -Financially weak -Limited technical capabilities	+Broad competence +Access to research grants - Less financial strength

Figure 49 Potential partners in floating foundations

Altogether, the potential opportunity for GVA within this niche is considered to be great, but with risk-taking and investments required to reach profitability. This would require a great deal of dedication and firm venturing and this is not a part of the current GVA strategy. Different kinds of partnerships are another way to affect the development. Then again, it requires commitment and collaborative partnerships, which can be difficult to manage.

8.4 Deriving a strategy for GVA

The offshore wind industry is an emerging high growth industry, which has attracted several firms from the oil & gas industry. While there are similarities and synergies between the industries, there are also several differences that are important to understand to derive a successful strategy. This project has looked at three different segments that could be of interest for GVA; substations, fixed and floating foundations. The segments are in different life-cycle stages and present different challenges.

GVA is currently in the substation segment that is considered to be attractive and requires the design capabilities that GVA possesses. The relationship with ABB provides a great entry channel into the industry for GVA to be an early mover in the high growth industry, with limited investment and risk. There is on the other hand a risk that the actual project scope in this segment may be limited when yards gets more involved in design and buyers get more knowledgeable. Hence, it is important to secure a space for GVA in the industry and take measures to build barriers to competitors. This can be done through locking in customers, developing technology platforms, managing intellectual property etc.

The fixed foundation segment shows a resemblance to the oil and gas industry for GVA. There is on the other hand a lower technical advantage since foundation design is currently not within the business scope of GVA.

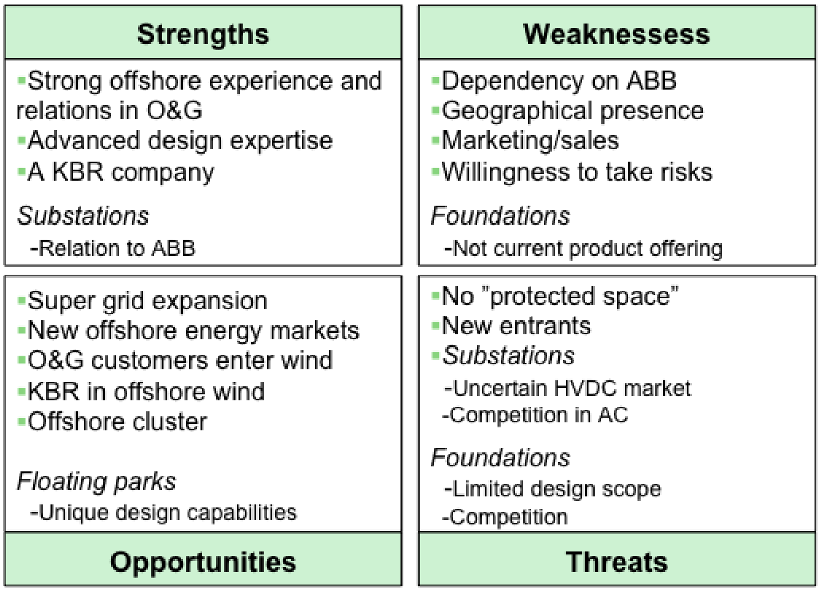
Substations	**Fixed foundations**	**Floating foundations**
▪ Considered attractive and suitable for GVA ▪ Agreement with ABB is an advantage, since it gives early experience without large investments ▪ Risk that project scope may become limited	▪ Market not favorable since GVA's competence is more advanced than needed ▪ Market requires scale economics ▪ KBR is involved in this segment and in better position than GVA	▪ Interesting but uncertain market segment ▪ GVA has unique knowledge within floating structures ▪ Large investments are necessary and venturing can be difficult

Figure 50 Summary of segments

While it according to the five forces analysis is an attractive market, it demands a certain volume to gain a cost advantage. As a small design firm, it may prove difficult for GVA to compete in this segment. Furthermore, since KBR is more involved than GVA in foundations it makes sense for GVA to consider avoiding the segment.

Floating foundation is a segment with a strong future potential, but the market is currently limited to a few demonstration projects. GVA does on the other hand possess unique capabilities in designing floating hulls in the oil and gas industry, which can create a competitive advantage in this segment. Hence, there is a potential to be an early mover in this segment to take part in early-stage development projects in partnership with other actors.

8.4.1 SWOT analysis for GVA entering the selected segments



Strengths	Weaknessess
▪Strong offshore experience and relations in O&G ▪Advanced design expertise ▪A KBR company *Substations* -Relation to ABB	▪Dependency on ABB ▪Geographical presence ▪Marketing/sales ▪Willingness to take risks *Foundations* -Not current product offering
▪Super grid expansion ▪New offshore energy markets ▪O&G customers enter wind ▪KBR in offshore wind ▪Offshore cluster *Floating parks* -Unique design capabilities	▪No "protected space" ▪New entrants ▪*Substations* -Uncertain HVDC market -Competition in AC *Foundations* -Limited design scope -Competition
Opportunities	**Threats**

Figure 51 SWOT – GVA in offshore wind

Strengths

GVA's strength is in its general knowledge in the offshore industry, including relations to yards, customers, contracting and how projects are managed. Several actors are also present in the wind industry while others are potential entrants. The design expertise is another key strength that gives credibility to the firm. On the other hand, there are several other firms that have the required capabilities for the wind industry, which reduces the firm's advantage.

A key strength for GVA is the strong supplier relation to ABB, which provides a potential for consultancy projects in design as well as advisory for their offshore operations. This is especially important in the HVDC substation segment where ABB is one of only two actors. Another important strength for GVA is being part of KBR. Since KBR is a strong engineering company and is attempting to increase its' presence in the U.K. offshore wind market. KBR and GVA have somewhat complementary offerings that enable a broader customer offering and increase GVA's strength in the market.

Weaknesses

Currently, GVA is dependent on ABB in the wind industry since it is the only customer. This creates a situation where there is a risk of investing in the industry, since GVA relies on recurring projects from this customer. Also, GVA has limited resources in marketing and sales, which reduces the ability to gain new customers and finding new opportunities. It could for example be of value to attend industry conferences and more actively sell projects to customers.

GVA is a small (and specialized) firm, and this limits the possibilities in some areas. There are for example several large engineering firms that are performing similar projects as GVA. These actors could take more aggressive measures to gain market shares in the industry, and complement the design offering with other activities. There is also a limited willingness to take risks in

GVA, which may limit the potential in the offshore wind segment. There could for example be an advantage in developing (and funding) concepts internally before approaching customers.

Opportunities

There are several external opportunities that GVA is exposed to through its involvement in the offshore wind industry. A super grid is currently being debated in the EU to connect countries transmission grids. Such a system would create a new market for offshore substations and increase the feasibility of wind farms significantly. There may also be new offshore energy markets such as wave and tidal power, which could require offshore substations in the long run. There is a great interest in these technologies and potential synergies with offshore wind systems could be developed.

Also, there are oil and gas companies moving into the industry, which is a strong sign of interest and belief in the industry. This gives GVA an opportunity to work with their customers in wind as well as in oil and gas projects. Additionally, KBR is looking at the opportunities in offshore wind and could be a great partner for GVA. The more global industry is also an opportunity for GVA. If the current projects in Europe turn out beneficially, it is likely that the interest will increase also outside Europe, increasing the total market size significantly.

Furthermore, several actors in West Sweden are showing an interest in the offshore wind industry and there are plans to initiate an offshore wind knowledge cluster. A cluster could create a competitive advantage to actors involved, and GVA could be a part of this. General Electric recently invested significant amounts in offshore wind in Sweden, which could be a strong trigger for other firms to follow suit.

Threats

GVA’s current lack of a “protected space” is a threat, and GVA does not have a clear role in the industry. The design scope is limited for GVA and there is a risk that the advisory role can be reduced, if customers gain more knowledge in the industry. There is also a risk that new actors enter the industry and increase the competition significantly, due to the limited competitive advantage of GVA in wind. In addition, there are uncertainties in the market demand for offshore wind in general and even more so in offshore HVDC transmissions. The uncertainties make it difficult for GVA to perform forecasts and allocate resources to the industry.

8.5 Managing threats and staying competitive

The offshore wind industry has presented an opportunity for GVA to differentiate their offering by opening up a new potential growth market. Successfully sensing and seizing new opportunities is important for the long-term performance of the company. The analysis have shown that there is a good match between GVA capabilities and some specific segments in the offshore, especially substations and floating foundations. On the other hand, there is a limited uniqueness in the technical capabilities required, and several firms are capable of performing the services required. Hence, GVA may be required to differentiate their offering through other means than the purely technical to stay competitive in the long run.

GVA's current position is in advanced design of deepwater semi-submersible oilrigs, a position that requires the best technological know-how and a strong track record. The value discipline in this main segment is the "product leadership", or competition through "best products". The analysis shows that the technical factors are less important in the offshore wind industry, where other dimensions may be more important for the customers. In the oil and gas industry, up time is a critical issue where every hour of drilling is important. In offshore wind, the value is rather in the life-cycle economics of a project.

When it is difficult to differentiate a company through product leadership, it may be necessary to focus on one of the other value dimensions, operational excellence, or customer intimacy, as seen in Figure 52. In both cases, it is important to understand the customer needs and the value chain activities that are required to create customer value.

Figure 52 Value disciplines. Source: Treacy and Wiersema (1995)

In this early stage of the offshore wind industry, it may be required to work with several strategies, to improve the chance of success. Unless the business model is adapted to new opportunities that arise, routines of a firm may block development and performance in new business activities. The key is to utilize the core capabilities to GVA's advantage to develop opportunities, but avoid being inhibited by embedded structures.

9 Recommendations

The recommendations are divided into a broad “business strategy” level and an execution level, which consist four parts namely segments, product offer, customers and organization (see Figure 53*).*

Figure 53 Structure of recommendation

9.1 Business strategy

Define goal and wanted position in offshore wind

In order to derive a strategy that can guide company decisions and execution it is important to have a general goal that the firm is aiming for. Without such a goal there is a risk that decisions become uncoordinated, resulting in ambiguous decisions that are hard for customers to interpret. GVA needs to know what the firm is aiming to be able to commit resources and to be proactive in the industry. That also provides credibility towards customers and a clear message of what the firm is offering.

Focus on customer intimacy as differentiator

For a small firm it is important to specialize and to focus in order to get a favorable position towards competitors. For GVA in offshore wind, product leadership is less important than in oil and gas, where designs are significantly more advanced. Instead, GVA should focus on customer intimacy as a differentiator. By understanding the customer needs, and providing the best total solutions to the customers, GVA can gain an advantage in the industry and become the preferred supplier.

Take an active role in the industry development

In the early stage of the offshore wind industry, with a lot of uncertainties in demand as well as supply, there is room for actors to proactively take part in shaping the industry. By being present at industry events and meeting other actors, partnerships can be developed and new solutions found. This requires a commitment from GVA to really become an important actor in the industry. Several strategies may have to be executed in parallel due to the uncertainties in the industry.

9.2 Segments

Substation industry first priority

The offshore substation is a segment where GVA can utilize its current capabilities and the relation with ABB to get involved in several projects with a limited effort. It is a good first step to get exposure to the industry and get involved in several projects. Within the substation market, HVDC stations should be the first focus since it demands more engineering efforts than AC and is more in line with other GVA projects. Also, ABBs strong position in this segment creates the possibility to work closely in collaboration to develop more projects. AC stations are also becoming more complex in deeper waters and the number of units will be significantly higher than for DC substations. Hence, there is a further potential in this segment.

Fixed foundations not focus for GVA

Fixed foundations is another growing segment, but is not suitable for GVA since it is currently not part of the firms' current design scope. It will be more competitive than the other segments since several actors are capable of performing the designs. GVA may get involved in some parts of the foundations through the substation market, but in these cases it is preferable to work with KBR since fixed foundations are more within their offering than that of GVA.

Be an early mover in floating foundation segment

In the long run there is a potential in floating wind farms, where GVA has a technical advantage compared to several competitors. While the industry is currently at a very early stage, there is still the possibility to take part in development projects. Statoil has invested in such a project and there are also potential research funds available for such projects. By taking part in early development projects, GVA could get an early mover advantage in this industry. Potential partners in such a coalition include developers, turbine manufacturers, transmission companies, entrepreneurial companies, as well as academia.

9.3 Product offer

Focus on being an ”offshore advisor”, more important than design specialist

In the offshore wind industry, the technical design scope is more limited than in the offshore oil and gas business. Consequently, there is a limited scope for GVA to differentiate through the product dimension. Instead the focus should be on providing “offshore advisory”-services to help the customers and to guide them. This role demands industry knowledge and relations to key actors such as yards, contractors, certification firms etc. The advisory role is also in line with the customer intimacy focus that is recommended.

Increase product offering with partners

The design and engineering scope is relatively limited in the substations while there is an opportunity to increase the offering to customers. Together with KBR there is a potential for the firm to take on larger projects, and expand the customer offering further. There is also a potential for KBR to collaborate with other actors, such as existing yards, to develop complete offerings to their customers. In the long run, there is a potential to provide complete substations to the customers together with partners.

9.4 Customers

Strengthen relationship with ABB

The relation with ABB is of key importance for GVA in offshore wind. The relation can be strengthened by more clearly communicating the long term intentions between the firms, and how to work together to reach those goals. GVA should work towards an increased project scope with ABB together with KBR and/or yards. GVA can position itself as the key supplier of offshore solutions to ABB.

Seek new customers

In order to create a sustainable position in the offshore wind industry it is important to work with more than one customer in the segment. That enables GVA to rely more on the business segment and increase the firms' commitment. It is however important that new customers do not conflict with the strong relation to ABB. New customers could for example be yards, OFTO developers or contractors in offshore wind. GVA should attend industry fairs in order to meet potential customers or partners. Also, basic marketing material should be provided on the website and in the form of leaflets that can be handed out at conferences.

Work together with KBR in marketing

GVA should also work together with KBR in marketing their services in the offshore wind industry. Their strong presence in the UK market and their brand provides as strong credibility in the market. GVA can also contribute through its current involvement with ABB and its high-end designs in oil and gas. Together, the companies can utilize their complementary offerings and their networks to improve their positions in offshore wind.

9.5 Organization

Form a group responsible for business development in offshore wind

In order to develop a successful strategy in offshore wind it is critical to get it to the strategic agenda of the management in GVA. That is the only way a true commitment can be created which is necessary for a successful strategy. An offshore wind management group should include the CEO of the firm, a business developer as well as an offshore wind director. The purpose of the group should be to develop GVAs offshore wind business by following up on the strategy of the firm, recent developments in the industry and projects that GVA is involved in.

Define roles and responsibilities with KBR to open up for further cooperation

There are benefits for KBR as well as GVA in combining their capabilities in offshore wind to gain synergies and improve their position in the industry. It is also important that the firms start discussing ways to collaborate, how to approach customers and how to market their services in a unified way. In this process, it is important to define the roles and responsibilities of the two firms to reduce the risk of internal competition and to improve the ability to reach common goals. Open communication is a key factor in developing the relationship further.

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11 Appendices

Appendix A: General Interview guide

General

How are you involved in the offshore wind business?

What potential do you see in the offshore wind market?

What are the main challenges for offshore wind growth?

- Policies
- Turbines/transmission
- Floating fundaments
- Super grid

What trends do you believe are most likely in the industry?

How will contracting of offshore projects change (EPC, split delivery)?

How will the industry handle a strong industry growth? (40GW by 2020)

Do you think we will see floating turbines within 10 years? Challenges?

Do you think there will be more standardization in industry?

Firms

How are you involved in the offshore wind business?

What is your role in the value chain?

What is your/intention strategy in the industry?

- What factors do you think will be of most importance for you to succeed?

Who is your customer? Do you think this will change in the future? (EPC/split deliveries)

Is standardization of importance for your strategy? Affects negatively or positively?

How would you assess the risk of new entrants in the industry?

Partnerships/Sub-contractors

- How do you work with partners/supplier?
- How important are your suppliers?

What scope can your company take? What scope have you taken in projects? What is the desired scope?

Appendix B: Description of an offshore wind farm

Currently, the offshore wind farms include up to 140 turbines[10]. Each turbine is built up of a foundation under the water, a tower above the sea level and on top of the tower is a turbine house attached, usually called the nacelle. The rotor is then mounted outside the nacelle. The generator, which mainly converts the mechanical energy into electrical energy, is placed within the nacelle. Depending on the technology of the wind turbine, the nacelle also includes converters and drives in different configurations. Additionally, a motor within the nacelle control the pitch of the blades as well as adjustments of the rotor towards the wind.

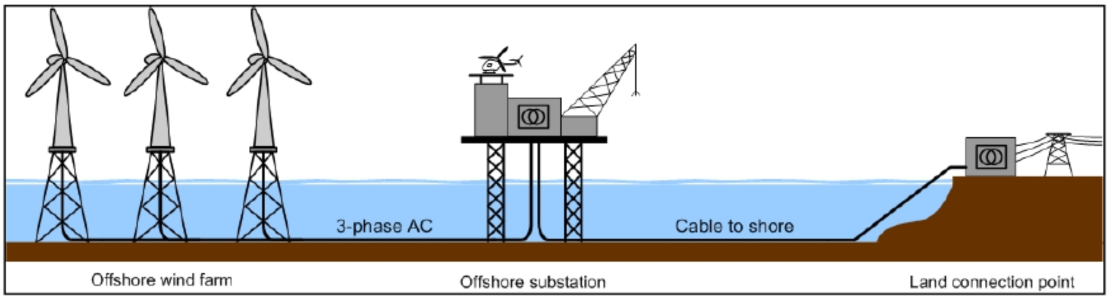

Figure 54 System view of an offshore wind farm

The electricity collected when the blades spin is transformed from low voltage (e.g. 690 V, 960 V or 1 kV) to middle-voltage (e.g. 12 kV, 24 kV or 36 kV) by a transformer either in the top beneath the nacelle or in the bottom of the tower. When the transformer is located in the bottom of the foundation, low-voltage cables is used to connect the generator drive train to the transformer. On the other hand, when the transformer is located in the nacelle, medium-voltage cables will connect the transformer to a circuit breaker located in the bottom of the foundation. From the circuit breaker, the turbine is connected to a collection grid of cables, sometimes called array cables, and these have at present usually 36 kV voltage level.

The collection grid is connected to a substation either on or offshore. At the substation the electricity is transformed up to 150kV, often even higher, to match the main grid voltage within the country. An export cable conducts the electricity to the main grid onshore. A SCADA (supervisory control and data acquisition) system is usually used to control and monitor the complete wind farm.

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[10] Greater Gabbard is the largest offshore wind farm at present and consist of 140 wind farms and there are plans on farms with up to 1000 turbines.