Competitive Strategy for Entering Wind Turbine Manufacturing Industry

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Abstract

The purpose of this thesis is to explore, how it is best to enter to the wind turbine manufacturing industry and suggest a competitive strategy for that purpose.

The thesis follows Michael E. Porter's Competitive Strategy framework. The market is analyzed using data and scenarios from World Energy Council, Global Wind Energy Council and European Wind Energy Association. As competitors, European-based wind turbine manufacturers belonging by their market share to Global Top 10 are analyzed. A five-point competitive strategy is drafted.

Technological innovations and business model improvements are not analyzed in this thesis.

The result of competitive strategy research performed in this thesis is, that a window to enter to wind turbine manufacturing industry is embedded into the process of establishing a new experience curve. The new experience curve is based on direct drive wind turbine concept. The thesis suggests that the market to enter the industry is European onshore wind turbine market.

A major barrier entering the industry is well established relationships between old wind turbine manufacturers and customers whereas the newcomers lack of sufficient references. A strategy to hurdle the barrier is acquiring the references by forward integration. Therefore, to enter to the market, wind turbine company should own its own wind park as a base of references and new product testing. As wind parks product, electricity is a commodity and sold on a commodities market, the forward integration does not need major extra know how.

Core competences for the emerging company include product engineering and quality management.

Key-words: strategy, competitive strategy, renewable energy, renewables, wind power, wind turbine manufacturing industry.
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Glossary

**Backward integration** – strategy to increase control over the suppliers by acquisitions. A form of vertical integration.

**Direct drive** – wind turbine construction where the rotor is installed directly to generator with no gearbox in the middle. In comparison to geared wind turbine the direct drive construction is more robust.

**Experience curve** – Experience curve is a phenomenon, that more experience has firm in producing a product, the lower are the costs of the product.

**Feed-in tariff** – a policy mechanism designed by governments to promote investments in renewable energy technologies by offering long-term contracts to pay premium for every kWh renewable energy produced.

**Forward integration** – business strategy oriented to control direct distribution of products. A form of vertical integration.

**Geared wind turbine** – wind turbine with construction where power from the rotor is transferred to the gearbox and from the gearbox to the generator. Gearbox increases the rotational speed speed of generator. The gearbox is a complex, costly and heavy part of a wind turbine.

**Horizontal integration** – horizontal integration is a business strategy of expanding by creating production units that are alike.

**Industry** – a group of firms producing products that are close substitutes to each other (Porter 1980).

**Onshore wind turbine** – wind turbine that is designed to be installed on land.

**Offshore wind turbine** – wind turbine that is designed to be installed on sea. Some offshore wind turbines are designed to installed to the surface of seabed and some to afloat.

**Primary energy** – energy in fond of nature that has not been subject to any conversation of transformation process. Primary energy, for instance wind is concerted by energy system (wind turbines) to an energy carrier (electricity).

**Renewable energy** – energy that is generated from resources that are naturally replenished on a human time-scale such as sunlight, wind, tides, waves and geothermal heat.

**Switching costs** – one-time costs the buyers face when switching from one product to another. It may include employee retraining, costs of new equipment, costs of time testing the new product or physic costs of severing the relationship.

**Utility company** – in this research electric utility company. A company that engages in the generation, transmission and distribution of electricity.
**Vertical integration** – strategy to expand along the supply chain by acquiring suppliers and distributors.

**WEC Jazz scenario** – World Energy Council scenario with focus on energy equity, and achieving individual access and affordability of energy through economic growth as priority.

**WEC Symphony scenario** – World Energy Council scenario with focus on achieving environmental sustainability thorough international policies, practices and agreements.

**Wind turbine manufacturing industry** – industry specified to designing, testing, manufacturing and assisting with the operation and maintenance of wind turbines.
1 Introduction

This section provides the overview of the background of the thesis, research objective and research question. The wider implications of the expected results of the thesis are also discussed within this section.

1.1 Background

Energy and engineering corporations are fighting to control planet's most powerful energy resource—the wind power. The wind-power business has grown from a marginal niche sector to one of the fastest growing global industries.

In the Organisation for Economic Co-operation and Development (OECD) countries the growth is driven by the transformation from fossil fuel energy to renewable sources and in non-OECD countries by need for extra energy production capacity and economics. As a consequence, the specialized wind-turbine companies that pioneered the industry, such as Vestas of Denmark or Gamesa of Spain have gone global. Big multinational engineering corporations, such as Siemens, and Mitsubishi Heavy Industries have entered the industry by takeovers, joint ventures or development of their own technology.

Wind turbine manufacturers have turned their attention to offshore wind power technologies, where the wind resources available are at bigger scale than onshore. For offshore use, wind turbine manufacturers have started to offer more and more powerful wind turbine models. Vestas has already 8 MW wind turbine in portfolio while several companies are developing wind turbines with output 10 MW. This trend increases wind power scalability and therefore competitiveness with other major electricity generating technologies.

But besides the offshore trend, there are also companies with more differentiation oriented strategies such as Germany's Enercon. Enercon is focusing onshore turbines using more robust direct drive wind turbine technology, that makes the machines more reliable in comparison to traditional geared wind turbines (Backwell 2014). Also there are companies in their prototype stage such as Finland's Mervento, who are looking for customers to launch serial production.

The current challenges of the industry include pressure to drive down costs that originates from the shale gas revolution and low prices of gas and oil. The challenge has led several companies, such as Vestas to launch a vast cut program and to re-design their supply chains from vertically integrated to horizontally integrated models. Other challenge for European wind turbine producers is to maintain their technological and market global lead position in the situation while American and Chinese companies are also emerging.
1.2 Research objective and question

The research question of this thesis is to develop a competitive strategy for entering to the wind turbine industry. The research is based on Michael E. Porter's industry's competitiveness theory (1980) and World Energy Council's Energy Scenarios (2013), Global Wind Energy Council (2014) and European Wind Energy Association (2014) market forecasts.

The objective of this thesis is to provide information on competitive level strategic opportunities for people who have technological knowledge on wind turbines, who are capable to innovate, but who lack of corporate experience and still want to enter to the wind turbine industry. The thesis develops a competitive strategy they can use as input to their planning process while looking for opportunities entering to the wind turbine manufacturing industry.

Wind is most competitive renewable energy source (WEC 2013). Finding strategies to enter to the wind turbine manufacturing industry make the sector more attractive for new companies to allocate their financial capital, research and development resources there. Increasing competition fastens the development of renewable energy technologies and increases their competitiveness over traditional, fossil-fuel based energy technologies. Stimulating development of renewable energy technologies has importance increasing sustainability of global energy sector through encountering negative effects caused by usage of fossil fuels.
2 Literature review and theoretical framework

This section provides reader with the literature review and theoretical framework of the thesis. Overview of different approaches to strategy are reviewed. Particular, the three Porter’s generic type strategies and their common implications are reviewed. In addition to that, structural analysis of the industry, including structural determinants of the intensity if competition, industry life cycle concept and industries evolutionary process are described. Finally, Porters competitive strategy theory is discussed against Eric Ries' repeated customer interaction based tool Lean Startup in order to provide reader critical thinking on the competitive strategy theory.

2.1 Strategy definitions

The classical definition of strategy is by Chinese militaristic author Sun Tzu (1990), who describes strategy as determination of the basic long-term goals and objectives, adaption of courses of action and allocation of resources necessary for carrying out these goals.

According to Porter (1996), competitive strategy is about being different. Company can outperform rivals only if it can establish a difference that it can preserve. Therefore the essence of a strategy is choosing to perform different set of activities differently than rivals do. The company must deliver greater value to customers or create comparable value at lower cost or do both.

Mintzberg (1994) suggests that people use strategies in different ways. Particularly, he mentions four ways: plan “how” to getting from “here” to “there”, pattern of actions over time, position that reflects definitions to offer particular products in particular markets and strategy could be also vision and direction perspective.

However, De Witt and Mayer (2004) say that topic of strategy cannot be explained as a set of straightforward definitions and rules. Nevertheless, they still agree that strategy is a way to assess companies long-term objectives and achieve competitive advantages in the business environment. Thus, in order to achieve its objective, this thesis follows the Porter (1996) definition based on establishing difference.

According to Porter, constant improvement in operational effectiveness is necessary to achieve superior profitability. However, it is not sufficient to achieve strategic success. Moreover, competition based on operational effectiveness alone is mutually destructive. Managers must clearly distinguish operational effectiveness from strategy – both are essential but the agendas are different.

Choosing a unique position does not guarantee a sustainable advantage because a valuable position will attract imitation by incumbents. To avoid that, a sustainable strategic position requires trade-offs. Porter describes trade-off more of one thing necessitates less of another. Trade-offs are essential to strategy by creating choice and purposefully limit what company offers. In real
managerial situations, compromises and inconsistencies in the pursuit of growth will erode the competitive advantage the company had with its original varieties.

## 2.2 Generic type strategies

Porter (1980) suggests three types of generic competitive strategies: overall cost leadership, differentiation and focus.

### 2.2.1 Overall cost leadership

The overall cost leadership concept relates to the experience curve concept. Cost leadership requires great deal of managerial attention to cost control, aggressive construction of efficient-scale facilities, vigorous pursuit of cost reductions from experience, tight cost and overhead control, avoidance of marginal customer accounts, and cost minimization in areas like research and development, service, sales force and advertising. The overall cost leadership strategy must be an organization wide effort, including quality, service and other areas.

Despite the presence of strong competitive forces the low-cost position yields the firm above-average returns in the industry. The cost position gives a firm a defense against rivalry from competitors. Lower costs mean that it can still earn returns after its competitors have competed away their profits through rivalry. Because bargaining can only continue to erode profits until those of next most efficient competitor are eliminated. In other words, the less efficient competitor will suffer. The low cost strategy provides defense in all “five forces” and places firm in a favorable position vis-à-vis substitutes relative to its competitors in the industry.

Achieving a low overall cost position often requires a high relative market share or favorable access to raw materials. The company should focus on volume. It may require designing products for ease in manufacturing, maintaining a wide line of related products to spread costs and serving all major customer groups in order to build volume. It may also need heavy capital-front investments to build state-of-art inventory, aggressive pricing that could turn to start-up losses when building the market share. Once achieved the low cost positions provides high margins (Porter 1980).

### 2.2.2 Differentiation

The differentiation strategy is about creating something that is perceived industry wide as being unique. Uniqueness and differentiation can be in many forms: design or a brand image, technology, features, customer service, dealer network or other dimensions. Ideally a firm differentiates itself along several dimensions. For instance Caterpillar Tractor. Heavy equipment manufactured by Caterpillar is known for its durability, where downtime is very low and also dealer network and excellent availability of spare products. Although the strategy does not allow a firm to ignore costs, they are not the primary targets and Caterpillar equipment is usually priced higher than its
competitors.

Differentiation provides insulation against competitive rivalry because of brand loyalty by costs resulting lower sensitivity to price. It increases margins which avoids need for a low-cost position. Customer barriers are established by need of loyal customers and need for competitors to provide uniqueness.

Put to the Porter's Five Forces theory, differentiation yields higher margins which to deal with supplier power. It clearly mitigates buyer power and since buyers lack comparable alternatives and are thereby less price sensitive. Achieving customer loyalty should be better positioned vis-à-vis substitutes than competitors.

Often differentiation will imply a trade-off with cost position if the activities required in creating it are inherently costly. Such as R&D, product design, high quality and expensive materials or intensive customer support. Not all customers are willing to pay the higher price. But there are also examples such as above mentioned Caterpillar that is market leader in earth-moving equipment as well as Apple in the field of personal computing and mobile phones (Porter 1980).

### 2.2.3 Focus

The generic strategy Focus is focusing on a particular buyer group, segment, product line or geographical market. Porter (1980) Focus may take many forms. The focus type strategy differentiates from cost leadership and differentiation that it could be not industry-wide as the before-mentioned two but could concentrate around serving particular target very well. The hypothesis of the strategy is that a company can serve its narrow strategic target more effectively by meeting the needs of particular target better or efficiently by offering lower costs than competitors who are competing more broadly. Or both.

Focus may be used to select targets least vulnerable to substitutes or where competitors are the weakest (Porter 1980).

### 2.2.4 Common implications of the generic strategies

The three generic strategies differ also in the skills obligatory to implement such as organizational arrangements, control procedures, and inventive systems. Porter (1980) points out some common implications of the generic strategies in these areas:
<table>
<thead>
<tr>
<th>GENERIC STRATEGY</th>
<th>COMMONLY REQUIRED SKILLS AND RESOURCES</th>
<th>COMMON ORGANIZATIONAL REQUIREMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Overall Cost Leadership</strong></td>
<td>Substained capital investment and access to capital</td>
<td>Tight cost control</td>
</tr>
<tr>
<td></td>
<td>Process engineering skills</td>
<td>Frequent, detailed control reports</td>
</tr>
<tr>
<td></td>
<td>Intense supervision of labor</td>
<td>Structured organization and responsibilities</td>
</tr>
<tr>
<td></td>
<td>Products designed for ease in manufacture</td>
<td>Incentives based on meeting strict quantitative targets</td>
</tr>
<tr>
<td></td>
<td>Low-cost distribution systems</td>
<td></td>
</tr>
<tr>
<td><strong>Differentiation</strong></td>
<td>Strong marketing abilities</td>
<td>Strong coordination among functions in R&amp;D, product development, and marketing</td>
</tr>
<tr>
<td></td>
<td>Creative flair</td>
<td>Subjective measurement and incentives instead of quantitative measures</td>
</tr>
<tr>
<td></td>
<td>Product engineering</td>
<td>Amenities to attract highly skilled labor, scientists, or creative people</td>
</tr>
<tr>
<td></td>
<td>Strong capability in basic research</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Corporate reputation for quality or technological leadership</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Long tradition in the industry or unique combination of skills drawn from other businesses</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Strong cooperation from channels</td>
<td></td>
</tr>
<tr>
<td><strong>Focus</strong></td>
<td>Combination of the above policies directed at the particular strategic target</td>
<td>Combination of the above policies directed at the particular strategic target</td>
</tr>
</tbody>
</table>

*Table 1: Common implications of the generic strategies (Porter 1980)*

**2.3 Structural analysis of industries**

Porter (1980) defines the industry as the group of firms producing products that are close substitutes to each other. Within the industry, competition continuously works to drive down the rate of return on invested capital. Industry structure determines the competitive rules and strategies potentially available for the firm (Porter 1980).
The state of competition in industry depends on competitive forces – there are five basic competitive forces according to Porter (1980). Profit potential in the industry is determined by those five forces. Knowledge of these underlying sources of competitive pressure reflects the critical strengths and weaknesses of the company and clarifies the area strategic changes and diversifications that may yield in greatest payoff.

2.3.1 Structural determinants of the intensity of competition

Threat of entry

Barriers to entry

Porter (1980) defines major sources of barriers to entry as following:

Economies of scale – Economies of scale gives new entrant two excluding choices: to come to the market at large scale and risk strong reaction from existing firms or come at small scale and accept the cost disadvantage. Both options lower the competitiveness of new entrant at the market. Economics of scale emerge in almost every function of business, for example research, marketing, service network. Economies of scale effect gives advantage also to multifariousness firms and multinational corporations through ability to reduce joint costs through share operations and functions.

Product differentiation – Established firms have brand identification, customer loyalties and already existing customer relationships that create stat-up costs for new entrants.

Capital requirements – The need to invest large financial resources, such as research and development and marketing to compete creates a barrier to entry. Although major multinational corporations have enough capital to enter almost any industry, entries represent a risky use of that
capital. Whether the capital originates from company's own balance sheet or external investors, the risks reflects the risk premiums charged from the return.

Switching costs – Switching costs are one-time costs the buyers face when switching from one product to another. It may include employee retraining, costs of new equipment, costs of time testing the new product or physic costs of severing the relationship. If the switching costs are high, the new entrant must offer a major improvement in cost or performance in order the buyer to switch from an incumbent.

Access to distribution channels – Existing competitors may have ties with channels that are based on exclusive contracts, long relationships or system lock-ins. Sometimes the barrier could be so high that a new entrant must create entirely new channel.

Cost disadvantages independent of scale – Cost disadvantages independent of scale include proprietary product technologies that are kept through intellectual property rights. Also favorable access to raw materials, favorable locations and government subsidies. The learning or experience curve, particularly in business that involves complex technologies can also create a threat to new entrants to the market.

Government policy – Government can limit access to markets with licensing requirements and limits on access to raw materials.

Expected retaliation

When the industry has history of vigorous retaliation to entrants, slow industry growth could result situation that new entrants could not be absorbed without depressing the sales of existing ones. If the established firms have substantial resources to fight back, the new entrant should be aware of retaliation (Porter 1980).

Entry deterring price

The prevailing structure of prices which just balances the potential rewards from entry with expected costs of overcoming structural entry barriers and risking retaliation. If the current price level is higher than entry deterring price, entrants will forecast above-average profits from entry and entry will occur. The incumbent companies possible strategy to eliminate entries will be to set price below this hypothetical level (Porter 1980).

Experience and scale as entry barriers

Achieving lower costs by economies of scale effect may involve trade offs with other potentially valuable barriers to entry such as product differentiation and therefore create a window to new entrants. Technological change may also penalize the large-scale firm if the facilities designed to profit from economies of scale effect are more specialized and less flexible to adapting new technologies. That may open a window for new companies to compete on that market.

If experience is the entry barrier, than the possible strategy of new entrants would be to copy the technologies, hire competitors employees and purchase the latest machinery from equipment suppliers. Where experience and know-how can not be kept proprietary, new entrants may have an
advantage over existing companies in the industry if they can buy the latest equipment or adapt the latest methods.

Other limits of the experience curve as an entry barrier could be mitigated by innovations that are leading to new technology and therefore creating a new experience curve. New entrants can leapfrog the existing industry leaders.

Another strategy would be to pursue low cost experience that may have trade-offs with valuable barriers such as product differentiation through image or technological progressiveness. If the industrial leader strategy is aggressive pursuit of cost declines, it may draw attention away from market developments and thereof open the window for new entrants who with other experiences can nullify market leaders past experience (Porter 1980).

**Intensity of rivalry among existing competitors**

Rivalry among existing competitors consists of tactics such as price competition, advertising, product introductions and increased customers services or warranties. Rivalry occurs because one or more competitors feels pressure to his position or feels opportunity to improve the position. Usually the firms in the industry are interrelated – move from one company results with move from its competitors. According to Porter (1980), some forms of competition, namely price competition are highly unstable and may leave the entire industry worse off from the standpoint of the profitability. Price cuts are quickly and easily matched by rivals.

Intense rivalry is the result of a number of interacting structural factors, such as following:

- **Numerous of equally balanced competitors** – When there are numerous relatively balanced size companies in the industry the likelihood of mavericks is bigger.

- **Slow industry growth** – If a firm seeks expansion, then slow industry growth turns competition into a market share game.

- **High fixed or storage costs** – High fixed or storage costs create strong pressures for all firms to fill capacity. That could often lead to rapidly escalating price cutting when surplus capacity is available. Situation with high storage costs creates a situation in which when product, once produced, is very difficult or costly to store. Firms are vulnerable to temptations to shade prices in order to insure sales.

- **Lack of differentiation or switching costs** – It the product is perceived like a commodity, buyers chose by price. Product differentiation and switching costs is a strategy against this phenomenon.

- **Capacity augmented in large increments** – That situation could easily lead to overproduction and price cutting. When economies of scale dictate that capacity must be added in large increments, capacity additions may become chronically disruptive to the industry supply/demand balance.

- **Diverse competitors** – Competitor firms with diverse strategies, backgrounds and personalities may have different goals and strategies how to compete. This may led to a
situation where competitors may continually run ahead into each other in the process.

- **High strategic stakes** – Rivalry becomes even more volatile when number of firms corporate strategy states that from the whole company's strategic point of view they have high stakes in achieving success in this particular industry.

- **High exit barriers** – Exit barriers are economic, strategic or emotional factors that keep companies in business with low earning or even negative returns on investment. Major sources of exit barriers could be specialized assets to particular business of location, low liquidation values or high costs of transfer or conversion. Also strategic interrelationships between business unit and other units in the company in terms of image, marketing ability, access to financial markets or shared facilities (Porter 1980).

**Pressure from substitute products**

Substitute products are the products that can perform the same function as the product of the industry. Substitute products set the ceiling to the price of the product company can set in the situation of competition. The more attractive the price-performance alternative is, the firmer the lid on industry profits. The substitutes that improve price-performance tradeoffs or earning high profit are the ones that came to under attention most by competitors (Porter 1980).

**Bargaining power of buyers**

Buyers compete with industry by forcing down prices, bargaining for higher quality or more services. Buyers also compete with each other. The result of competition from buyers is that they lower industry's profitability. The strength of a buyer group is determined by a number of characteristics and the importance of the purchases in comparison with the overall business. According to Porter (1980), a buyer group is powerful if the following circumstances hold true:

- **It is concentrated or purchases large volumes relative to seller sales** – Large-volume buyers are particularly powerful forces if heavy fixed costs characterize the industry.

- **The products it purchases from the industry represent a significant fraction of the buyer's costs or purchases** – The buyers are more interested to look for favorable price because it is a major factor for keeping the costs under control for the buyer.

- **The products it purchases from the industry are standard of undifferentiated** - Commodities or close to commodities products mean that buyers have always the alternative and can play companies against each other by putting them con compete on price and other sale conditions.

- **It faces few switching costs** – Low switching costs give buyers more power to switch the companies and play one company against another.

- **It earns low profits** – Low profit puts the buyers to search for ways to lower the costs. Highly profitable buyers are generally less price sensitive.

- **Buyers pose a credible threat of backward integration** – Backward integration means that buyers are able to manufacture the products also by themselves. It puts them into position to
demand bargaining concessions. Also they have more information on the costs of producing the product they are purchasing. Buyers power can be partially neutralized when firms in the industry offer a threat of forward integration into the buyers industry.

- *The industry's product is unimportant to the quality of the buyers products or services* – Buyers are generally not very price sensitive towards the products that determine the quality of their products. The logic works also vice-a-versa.

- *The buyer has full information* – With full information of the costs, demand, actual market prices and yields the buyer is in greater position to ensure that in receives most favorable prices (Porter 1980).

**Bargaining power of the suppliers**

Suppliers bargaining power means that they can threaten to rise prices, reduce quality or negotiate terms of delivery. Powerful suppliers can thereby lower the profitability of the industry. A supplier group is powerful if the following characteristics apply:

- *It is dominated by a few companies and is more concentrated than the industry it sells to* – Suppliers selling to more fragmented buyers are usually able to more dictate the terms and prices.

- *It is not obligated to contend with other substitute products for sale to the industry* – Even large suppliers can be checked if they compete with substitutes. But if they do not compete, it is not possible to check.

- *The industry is not an important customer for the supplier group* – Supplier can accept the higher level of risk of losing the buyer.

- *The suppliers product is an important input to the buyers business.* This rises the supplier's power.

- *The supplier group's products are differentiated or it has built up switching costs* – In this situation supplier can play one buyer against another.

- *The supplier group poses a credible threat of forward integration* – This provides a check against industry's ability to improve purchase terms (Porter 1980).

### 2.3.2 Industry life cycle concept

The stage of the industry is a major factor when developing a competitive strategy. According to the industry evolution theory we can define four stages of industry's life cycle: introduction, growth, maturity and decline. The four states describing industry evolution and growth follow an s-shaped curve.
Emerging industries in introduction and early growth phase are industries that are newly formed or recently re-formed based on major changes such as technological innovations, shifts in relative cost relationships, emergence of new customer needs other economic and sociological changes. Industry has high profits and high margins. The buyer group is widening. Products have technical and performance differentiation.

Companies in the maturity stage are characterized by standardization, lowering necessary skills and prices. Here is less product differentiation. The slowing growth increases the competition in the industry, competition could change the terms of cost. Manufacturing methods are undergoing change as well. Maturity industry has some overcapacity. The strategic implications in industry transition to maturity include rising importance of cost analysis and rationalizing the product mix. However, firms offering more valuable products than the standardization and high volume oriented market leaders can enjoy cost advantages over the high volume producer.

The declining phase of industry is characterized with shrinking margins, reducing research and development, advertising and decreasing number of competitors. The strategy is “harvesting” - eliminating as much as costs as possible in order to generate maximum positive cash flow from the industry (Porter 1980).

2.3.3 Industries evolutionary process

Long-run growth rate of the industry changes

The evolutionary processes in the transition from one process to another have some common characteristics through the industries. First, the long-run growth rate of the industry changes. Industry growth rate is a key variable defining intensity of rivalry in the industry through influencing the supply and demand balance as well attractiveness for new entrants.

Changes in buyer's segment and buyers learning curve

Another change is embedded in changes in buyer's segment that are served. The buyers segments served have fundamental influence on sector's structure. Buyers have also their learning curve as they accumulate knowledge on a product. As a result of that process products have a tendency to
become more like commodities.

**Reduction of uncertainty**

Evolutionary process includes a reduction of uncertainty. During the continuous process uncertainties associated with technological solutions or business models are solved, technologies are proven or disproven. Reduction of uncertainty may result in new types of entrants into the industry, particularly large, established firms with lower risk profiles than newly created companies.

**Diffusion of proprietary knowledge**

As the technologies became more established the knowledge about the technologies will widespread and the industry encounters diffusion of proprietary knowledge. The diffusion process evolves through distributors, buyers, suppliers, organization's structure, personnel turnover and other ways information is spread. According to Porter (1980), from the strategic point of view the diffusion of knowledge about technology means that to maintain position existing know-how and specialized personnel must be protected, technological development must occur to maintain the lead and strategic position must shored up in other areas. However, there are vice-a-verse practices to Porter's theory also in the world. For instance, the electric vehicle manufacturer Tesla, who removed protection from their intellectual property and let their patents free in order to enlarge the electrical vehicle market space to combustion-engined vehicles (Tesla 2014). Electric vehicle industry is in its introduction phase.

**Accumulation of experience**

Accumulation of experience, such as experience in manufacturing, distributing and marketing is also a characteristic describes industry's evolutionary process. The importance of the learning curve is that it can give companies with more experience advantages in the market over the new entrants. Firms behind must be unable to copy the methods of leaders. If the new entrants are able to execute strategy of leapfrog, then the leaders have disadvantage in this situation.

**Increasing scale in industry**

Increasing scale in industry has numerous implications to industry structure. It tends to widen the set of available strategies in ways that often lead to increase in capital requirements in the industry. Such as may allow larger firms to substitute capital of labor or adopt production methods subjects to greater economies of scale.

**Change of input costs**

Change of input costs is part of industries evolution process. Wage rates change as production becomes more standardized, material costs decrease because of economics of scale effect. Capital cost decreases if the technology proves itself and reduction of uncertainty as well as risk level.

**Products, marketing and processes innovation**

During the evolution of industry, products, marketing and processes innovate. It can do the product more accessible to wider area of customers. Many innovations flow vertically, originated by customers and suppliers (Porter 1980).
2.4 Structural analysis and competitive strategy

If the forces affecting competition in an industry have diagnosed, the firm is able to position its strengths as well as weaknesses into relation with the industry. The crucial strengths and weaknesses are the firm's strategic posture against each competitive force. According to Porter (1980), an effective competitive strategy takes offensive or defensive action in against each five competitive forces.

**Positioning**

The possible approached could involve positioning the firm so that its strengths can provide best protection against the existing portion of competitive forces. Strategy could be viewed as building as much as possible defense where the competitive forces are strongest and finding positions in the industry where the forces are weakest.

**Influencing the balance**

The balance of forces could be moderated with strategic moves that improve the firm's strategic position. The actions to cope with competitive forces and influence balance could be marketing, allocating capital, vertical integration, creating or purchasing intellectual property.

**Exploiting change**

Exploiting change strategy bases on anticipating industrial evolution and the shifts in the factors that underlay the forces and responding to them. Thereby firm can exploit change by choosing a strategy appropriate to the new competitive balance before rivals. Anticipation could be based on product life-cycle pattern of industry for instance. Critical success factor is to understand weather the changes affect the structural sources of competition.

The outcome of the structural analysis may differ greatly from the existing industry structure.

2.5 Author's discussion over Porter's competitive strategy approach

Competitive approach for strategy development is based on understanding the surrounding environment of the firm. Describing the competition and rivalry among the existing competitors, threat of new entrants, threat of substitute products and services, bargaining power of buyers and bargaining power of suppliers. All together known as Porter Five Forces. Competitive strategy approach is a top-down approach for developing as strategy based on fundamental principles of free market and trade.

However, competitive strategy approach and Porter's five forces do not reflect customers needs or does it to a very limited extent. The customer's needs are translated into the strategy by rivalry among existing firms, threat of substitutes and bargaining power of buyers to some. The customer's
interest as input to strategy is absorbed circuitously.

There are bottom-up strategy development tools available, such as Lean Startup by Eric Ries (2011). According to Lean Startup, the strategy development process originates on continuously repeated interactions with customer and validated learning from these interactions. First, minimal viable product is developed that represents the fundamental business hypothesis with few resources as possible. The business model is described with lean canvas, a Lean Startup adaption of Alexander Osterwalder's Business Model Canvas (Strategyzer 2015). Lean canvas consists of fields for addressing broad customer problems and delivering solutions to these problems through unique value proposition.

![Lean Canvas](image)

**Figure 3: Lean Canvas (Maurya 2012)**

Then the business model is pivoted. Pivoting, according to Ries (2011) definition is structured course correction designed to test a new fundamental hypothesis about the product, strategy and engine of growth. Pivoting means changing the plan and making corrections to the Lean Canvas parameters as well as to minimum viable product. The change is implemented around one field that is left unchanged and all other fields are pivoted according to the learning.

After that the same procedure is repeated. Repeating these procedure form a Build-Measure-Learn loop that is the core of Lean Startup (Ries 2011).

When comparing Lean Startup with Competitive Strategy we can point out that the latter may lack in the information regarding the customer needs. Because Competitive Strategy approach reflects customer needs to strategy through the market, information is received with a delay in comparison to rapid feedback of Lean Startup.
As Ries' Lean Startup is based on generating measurable results it gives explicit answers that are more robust to understand. Porter's Competitive Strategy is more general and requires wider background knowledge to bring the results into practical decision-making level.

Despite that we can not say that one is more advanced over another or one should be preferred over another. Both, Competitive Strategy theory and Lean Startup tool supplement each other and they could be used in parallel.
3 Methodology

This section describes the methodology the thesis uses to develop the competitive strategy for entering to the wind turbine manufacturing industry. The methodology includes research paradigm, research design, data collection as well as limitation and delimitation of the research. Sustainability and ethical implications of the expected results of the thesis are also addressed in this section.

3.1 Research paradigm

Most elements of the research of this thesis are qualitative research relying on a the paradigm of interpretivism. As highly structured quantitative research design imposes constrains on the results and more over, may ignore some relevant findings, the interpretivism is more relevant for accomplishing the aims of this thesis than positivist paradigm (Collins and Hussey 2014).

Theories related to Porter's competitive strategy such as five forces analysis of the level of industry competition and the structural determinants of five forces, the generic type of strategies and their implications, theory of industrial evolutionary process and industry's life cycle concept are interpretative.

However the thesis also includes positivist elements as well. Positivist elements are the types of wind turbines and power outputs of wind turbines. Also the quantitative data describing wind turbine markets and market dynamics can be considered as a positivist element of the research.

3.2 Research design

The research purpose is predictive by type – to develop a strategy to enter to the wind turbine manufacturing industry.

The research is based on Porters competitive strategy theory. The author has decided to use competitive strategy theory, not bottom up, repeated customer interaction oriented approaches such as Eric Ries' Lean Startup tool because competitive strategy adds more value for the target group. The target group are people who have knowledge on designing or operating wind turbines. They already have knowledge on the customer need and technology opportunities. But they may not have knowledge on intensity of rivalry, competitor strategies and overall trends of the industry. Therefore, taking account the target group of the thesis, author has decided to use competitive strategy theory over the customer interaction oriented tools.

The process of the research is a qualitative. The theories related to Porter's competitive strategy,
such as five forces and analysis of the level of industry competition rely mostly on qualitative research. Also the competitors are analyzed using process of qualitative research. However, market research relies also on quantitative data and therefore can be classified as quantitative research.

The research is designed to solve a specific problem – how a company can enter to the wind turbine industry. The outcome of the thesis is an applied research by nature. The core theory the thesis is based, the competitive strategy is a deductive framework.

The steps to conducted in order to achieve the results of the thesis could be summarized as follows. First, the research paradigm is set according to the nature of the research of the thesis. Then, the theory is reviewed: strategy concept in general and competitive strategy theory and its implications in particular. Thereafter, the wind turbine market current situation and outlooks are examined using data published by international energy organization. In addition, six competitors and their strategies are reviewed and classified using Porter's generic strategy types. The theory of competitive strategy is applied the wind turbine market data and implications of competition are analyzed. Based on that, as well as competitors strategies, a strategy to enter to the wind turbine industry is developed and presented.

### 3.3 Data collection and ethics


As the research is based on public sources and data, the ethical issues regarding processing and publishing the data and providing confidentiality to the sources are not expected to rise during the research.

### 3.4 Limitation

A constrain to the research is accessibility to the information. The working documents of strategy development units at wind turbine manufacturers is classified information and thus, limiting the research. Therefore, the research is based on public information such as information on annual reports and press releases of listed companies, information on strategies published on company web pages as well as market outlook analysis.


3.5 Delimitation

This research is based on competitive strategy theory and does not base on bottom-up, costumer-interaction oriented strategy development frameworks. The rationale behind this decision is that the knowledge on wind turbine technology and understanding customer need is a critical success factor for the wind turbine manufacturing company founders must have anyway. Therefore the competitive strategy research adds more value to the firms management knowledge mix. The delimitation of the research is:

- The research does not analyze technological innovations and business model improvements of wind turbine manufacturers;
- The research is not focused on one single firm and its market penetration strategy but aims to develop suggestions on more general level.

Another delimitation is that, analyzing competitors, the research looks only European wind turbine manufacturers positioned in TOP 10 by companies global market share in 2014. In addition, Finnish wind turbine manufacturer Mervento, that has developed a wind turbine model and set up a prototype but has not managed to find customers by the time of writing this thesis.

3.6 Sustainability and ethical implications of the expected results

Wind is most competitive renewable energy source (WEC 2013). Finding ways to enter to this industry increases competition among wind turbine manufacturers. Technological improvements of wind turbines, driven by increasing competition increase renewable energy's competitiveness over traditional, fossil-fuel based energy technologies. This has impact on increasing energy sector sustainability by encountering fossil fuels usage and negative effect caused by it.

The ethical aspects of this thesis relate to making renewable energy more accessible to larger quantities of companies and people. This includes ethical aspects embedded to transformation from fossil fuels to renewable energy that has impact particularly in industries consuming energy in large quantities. But also providing energy to regions and people in the developing countries who currently do not have access to electricity.
4 Market outlook and overview of competitors and their strategies

In this section, the data on wind turbine's market and strategies of major companies operating on the market are presented. The outlook is presented in two time horizons: general level energy market outlook is provided on time horizon 2050 and detailed level wind turbine market outlook horizon 2020. Horizon 2020 outlook is presented by regions: Europe, Asia, North-America, Latin-America, Africa, Middle East and Pacific. The outlook pointing out the main trends as well as main drivers and risks behind the forecaster trends.

This section reviews main competitors and their strategies. The strategies are classified according to Porter’s generic types strategies. European wind turbine manufacturers belonging to Global Top 10 are reviewed, total 6 companies. In addition, a Finnish company Mervento, who has completed its first prototype currently searching for first customers is reviewed.

4.1 Market current situation and outlook

4.1.1 Long-term energy market perspective – 2050

World Energy Council (WEC) predicts that the energy landscape in 2050 looks very much different than it does today (WEC 2013). WEC published the outlook in two parallel scenarios. One, called Jazz with focus on energy equity, and achieving individual access and affordability of energy through economic growth as priority. The other scenario has a focus on achieving environmental sustainability thorough international policies, practices and agreements. The latter is named as Symphony.

The world population will be increased from 7 billion to around 9 billion (8.7 – Jazz and 9.4 - Symphony). The GDP per capita will increase from 9000 US$ in 2010 to around 20000 US$ in 2050.

The outlook predicts that energy demand will increase as well and puts immense pressure on energy system to develop. WEC estimates that by 2050, the total primary energy supply and consumption will increase globally to 244 PWh in Jazz scenario and 193 PWh in Symphony scenario. At 2010 the corresponding number was 152 PWh. That corresponds to increase of 61% or 27% respectively. For comparison, between 1990 and 2010, total primary energy consumption increased approximately 45% - it is expected that energy consumption’s rise will be at much lower rate than previous decades.

The outlook for future energy mix shows that the growth rates will be the highest for renewable energy sources. However, fossil fuels such as coal, oil and gas will remain dominant at 2050 as well. The share of fossil fuels will be 77% in the Jazz and 59% in the Symphony compared 79% in
2010.

By 2050, economic growth shifts from developed countries to developing countries and transition economies, particularly in Asia. Nearly half of economic growth will happen in Central and South Asia, East Asia, Southeast Asia and Pacific. According to WEC Jazz, the share of Asia on total primary energy consumption will increase from 40% in 2010 to 48%. In WEC Symphony, respectively 45%. By 2050, Europe and North America (including Mexico) will make up about 30% of total global primary energy consumption in Jazz and 31% in Symphony (2010: 44%). Africa, including the Middle East will account for 15% (Jazz) and 16% in Symphony (2010: 11%) and Latin America and The Caribbean (LAC) 8% in Jazz and 7% in Symphony (2010: 5%).

**Figure 4**: Electricity production forecast up to year 2050, scenario "Jazz" (WEC 2013)

**Figure 5**: Electricity production forecast up to year 2050, scenario "Symphony" (WEC 2013)
4.1.2 Mid-term wind turbines market perspective - 2020

By 2020, WEC predicts total installed capacity of wind power to rise 404 GW (Jazz scenario) or 667 GW (Symphony scenario) with outlooks to 2030 respectively 621 GW and 1059 GW. Revenue generated per MW of wind power capacity produced is around 1.5 million Euros (15 billion Euros per GW). The market is dominated by Asia and followed by Europe (GWEC 2014).

2014 was a great year for wind turbine manufacturing industry with 44% annual market growth and more than 51 GW installed capacity. 23 GW (45%) of that was installed in China. The emerging markets are also in Africa, Latin America and Asia while OECD markets continue to make steady progress as whole.

In OECD countries, the development of wind power is driven by government policies, that originate also from ethical concerns over the environment and climate. Denmark has been the leader of this with Germany following where wind power has reached double-digit penetration rates. The traditional government policy is to implement a feed-in tariff structure, but there is a move towards more market based approaches such as traded green certificates.

In non-OECD countries the wind turbine development is driven by economics, energy security, price stability. Especially in China also by the need to address the smog that is making the urban industrialized areas in developing world livable. It means for markets period of sustained growth.

**Figure 6: Global Market Forecast up to 2019 (GWEC 2014)**
Increasing competitiveness of wind power over technologies over renewable is a major trend in mid-term perspective. As a reflection to this process, major utility company E.ON SE announcing that its new strategy is to split renewable and fossil fuel based energy businesses to different companies. E.ON will continue with three core businesses: renewables, distribution networks and customer solutions, while the new company formed as a result of the split will operate power generation, global energy trading, and exploration and production (E.ON 2014).

**Europe**

The main driver on European markets is European Commission’s Renewable Energy directive (GWEC 2014). The directive states that by 2020 member states 20% of the final energy
consumption must come from renewable sources (European Commission 2009). Supported also by the national action plans, European targets will result in installing new wind capacity of cumulative installations of 75 GW (GWEC 2014) European Wind Energy Association central scenario predicts, that installed capacity increases by 64% compared to 2013 192,5 GW. That produces 442 TWh meeting 14,9% of Europe's overall electricity consumption in 2020. The low scenario predicts onshore installations of 165,6 GW (increase of 41% compared to 2013) and offshore installations of 19.5 GW. The high scenario respectively 217 GW (84,9% compared to 2013) and 28 GW (EWEA 2014).

The major factors influencing market developments besides economic reality are stability of regulatory market and frameworks for wind energy. This has impact on wind power investment plants, new orders as well as investment decisions already taken across the Europe. Retroactive and retrospective changes to regulatory market frameworks have had a negative impact on wind energy sector and it continues to be the major risk in the future (EWEA 2014).

In Europe, Germany's performance will likely remain strong throughout the period mostly due to the offshore segment developing in earnest. Also re-powering the onshore wind parks. UK market is predicted to be stalled and waiting for the outcome of the elections, that would give some stability and positive support for the sector. Sweden and France are believed to continue their good performance. The increase in growth is predicted for Poland and Turkey. The latter is predicted to become a major market.

The offshore market seems to be in much healthier place than it was before 2014 with more realistic targets and greater diversity of suppliers of next generation 5MW and more powerful offshore wind turbines (GWEC 2014). Offshore installations are predicted to reach almost 23,5 GW (EWEA 2014).

The factors that could change the 2030 outlook include energy demand and overall state of the countries economies, pressure on public spending, agreements on EU post 2020 targets. Also the potential impact of the 2015 COP climate negotiations in Paris (EWEA 2014).

Asia

Overall 140 GW is expected to be installed up to 2019 in Asia. If Chinese government decides to give expiration of current feed-in tariff arrangements in the end of 2015, the market will grow at similar scale as in 2014. Although the market may contract certain amount after that, GWEC predicts that China will alone install additional 100 GW by the end of 2019 exceeding country's 200 GW target for 2020 a year ahead of time.

India's *de facto* target, set by government is 5 GW per annum for the rest of the decade. Elsewhere in Asia the strong growth is expected in Pakistan, Philippines, Taiwan and Thailand (GWEC 2014).

North America

Overall 44 GW is expected to install in this region during next five years. USA market has strong pipeline projects for 2014 and 2015 and these ensure good growth. What happens after that is considered uncertain. Major concerns are the political decisions made on national level after the
new president is elected in 2016.

Same situation is in Canada, where governments support for the sector after 2016 is not certain. Mexico legislation sets \textit{de facto} target of at least 2 GW annum going forward (GWEC 2014).

**Latin America**

Latin America region is expected to install around 25 GW over the next five years. The market is led by Brazil, which wind sectors expected to install 12-13 GW over next 5 years. Brazil has auction system for subsidies. Wind is likely to surpass gas in terms of installed capacity and will become second biggest source of power in the country. Despite the current economic slump and political unrest, Brazilian wind market looks solid for the foreseeable future.

Chile market took off 2014 and however it will not be rival to Brazil, it will be a modest but steady market. Uruguay and Peruvian markets are starting to move also. Panama is about to add a small but cumulatively significant numbers put in Central America and Colombia may start to emerge at the end of 2010s. Argentina, although it has some of world's best wind resources has tapped because of lack of governmental support towards wind energy (GWEC 2014).

**Africa and the Middle East**

GWEC predicts total installations around 13 GW though 2019. Driven by South Africa, Egypt, Morocco, Ethiopia and Kenya, African market is expected to install around 1 GW per annum during the next five years. Jordan and Iran are also potential emerging markets towards the end of the decade if current negotiations in governments succeed. The market is driven not by government subsidy policies but the need for power as the wind is cheapest way to add capacity to the grid in the country. There are roughly 500 million Africans currently without any electricity.

**Pacific**

The prediction expects to be 4 GW added the region over next five years. Australia is the main market in the region. Although Australia has tremendous wind and solar resources renewables do not have support from the government currently there. The situation is not improved in New Zealand. And that is the reason why only 4 GW developments are predicted (EWEA 2014).

### 4.2 Competitors

Top 10 wind turbine manufacturers are listed in the following table.

<table>
<thead>
<tr>
<th>Company</th>
<th>Location Country of Headquarters</th>
<th>Global Market Share</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Vestas</td>
<td>Denmark</td>
<td>13,2%</td>
</tr>
<tr>
<td>2 Goldwind</td>
<td>China</td>
<td>10,3%</td>
</tr>
<tr>
<td>3 Enercon</td>
<td>Germany</td>
<td>10,1%</td>
</tr>
<tr>
<td>Company</td>
<td>Location Country of Headquarters</td>
<td>Global Market Share</td>
</tr>
<tr>
<td>------------------</td>
<td>----------------------------------</td>
<td>---------------------</td>
</tr>
<tr>
<td>Siemens Wind Power</td>
<td>Germany/Denmark</td>
<td>8,0%</td>
</tr>
<tr>
<td>Senvion</td>
<td>Germany</td>
<td>6,3%</td>
</tr>
<tr>
<td>GE</td>
<td>US</td>
<td>4,9%</td>
</tr>
<tr>
<td>Gamesa</td>
<td>Spain</td>
<td>4,6%</td>
</tr>
<tr>
<td>United Power</td>
<td>China</td>
<td>3,9%</td>
</tr>
<tr>
<td>Ming Yang</td>
<td>China</td>
<td>3,7%</td>
</tr>
<tr>
<td>Nordex</td>
<td>Germany</td>
<td>3,4%</td>
</tr>
</tbody>
</table>

Table 2: Top 10 wind turbine manufacturers (Smead 2014)

As following, strategies of European-based wind turbine manufacturers belonging to global Top 10 are reviewed and analysed in order to classify company's strategies according to Porter's generic types. The analysis do not predict to find one-to-one matches of companies strategies and Porter's classifications, but focused on finding main characteristics of companies strategies.

4.2.1 Vestas

Vestas Wind System A/S is a wind turbine company headquartered in Copenhagen, Denmark. Vestas is the largest global player and market leader in the wind turbine manufacturing industry. Vestas has delivered 66 GW (53,743 wind turbines) in 73 countries around the world and have manufacturing facilities in North and Latin America, Europe and Asia. In 2014, Vestas’ revenue amounted to EUR 6.9bn. Vestas Wind Systems A/S is listed at Copenhagen Stock Exchange. (Vestas 2015a)

Figure 9: Vestas share price dynamics 2005 - 2015 (Bloomberg Research 2015a)
Vestas strategy classification

Vestas current strategy is named as Profitable Growth for Vestas and this strategy was introduced after the downturn in 2012. New strategy has focus on spending cuts and is set to three focus areas:

- reduction of costs through operational excellence;
- reduction of investments through asset-light solutions and simplified product roadmap;
- improvements of capacity utilization and capital efficiency through divestments and supply to third parties (Vestas 2013).

The change executed reflects in reduction of investments and personnel. 2009, 2010 and 2011 the levels of investments were respectively 808, 789 and 761 million Euros. 2012, 2013 and 2014 respectively 286, 239 and 285 million Euros. The decrease was from 13% of revenue in year 2011 to 5% of revenue in 2012 and 4% of revenue in 2013 and 2014. After implementation of new strategy in 2012, the number of employees was reduced by 4843, from 22 721 to 17 778. As 2014, the number of employees is 17 905 (Vestas 2013, Vestas 2014, Vestas 2015c).

According to CEO Andres Runevalt, company's mission is to deliver superior efficiency and profitability and focus, that their services become even more competitive across the markets both within the wind turbine manufacturing industry and compared to other energy sources (Vestas 2015c, pp 4).

Significant cost cut program that is the result of the strategy, as well as product standardization by simplifying product roadmap indicates that Vestas prioritizes low cost over innovational technologies. This, as well as CEO's statement reflect that Vestas strategy could be classified as an overall cost leadership type of generic strategy.

4.2.2 Enercon

Enercon has produced more than 22 000 wind turbines that are installed over 30 countries with installed capacity of 32,9 GW. Company's head office is in Aurich, Lower Saxony and has production facilities in Germany, Sweden, Brazil, Turkey, Portugal, Canada, Austria and France. It has more than 300 service stations worldwide.

Based on installed capacity, Enercon's market share in Germany is 43,1% in comparison to 10,1% worldwide. Enercon focuses only on onshore direct drive wind turbines.

Enercon GmbH was founded in 1984 in Germany. In 1992 Enercon pioneered gearless direct drive wind turbine technology – Enercon E-40 with a rated power of 500 kW. According to Enercon, this innovative drive system with few rotating components ensures nearly friction-free energy flow and provides significantly increased performance and reliability. It reduces mechanical stress, operating and maintenance costs and increases system's service life. The non-gearbox concept is that Enercon is using up today.

All Enercon systems feature a grid connection system which fulfills current grid connection requirements and thus can be easily integrated in any supply and distribution structure. Enercon
offer solutions for normal operation such as reactive power management and voltage control as well as critical situation resulting from network short-circuits or bottlenecks (Enercon 2015a).


**ENERCON PartnerKonzept**

ENERCON PartnerKonzept (EPK) is a quality assurance feature that Enercon guarantees wind turbine technological availability above 97% a year up to 15 years exploitation period. EPK contract covers servicing to safety inspections, maintenance and repairs by Enercon. Damage caused by unforeseeable events such as acts of nature and vandalism can be covered by a specially developed additional EPK insurance policy that are available through most well-known insurance companies.

The fees under EPK contract are based on the annual wind turbine output and the customer pays a minimum fee depending on the respective wind turbine type plus a yield-oriented surcharge. The fee is calculated separately for each individual wind turbine / wind farm per year and according to the annual kWh produced during the elapsed operating year. If technical availability is below 97%, Enercon issues the customer a credit if the missing income is due to the lack of availability (Enercon 2015b).

**Enercon strategy classification**

Enercon's focus to only onshore and direct drive turbines. Also the company does not offer its turbines on US nor Chinese markets. In an interview, Enercon's CEO Hans-Dieter Kettwig has said: “We have always tried to sell on the basis of quality. Enercon customers buy from us because of our quality. In the end, our maintenance service package – the Enercon Partner concept – and our technology still make us competitive at attractive prices for both us and our customers (Renewables International 2012).” Kettwig points out, that the company is focused on technological and service concept excellence. Based on that, Enercon's strategy could be classified as a differentiation type of strategy. As Enercon only focuses on specific markets, the strategy could be also classified as a focus type of generic strategy. Porter (1980) describes the focus type generic strategy as focusing on particular buyer group, product line or geographical market. The aim of focus strategy is to serve the narrow market effectively than competitors who are competing more broadly.

**4.2.3 Siemens Wind Power**

Siemens Wind Power A/S, part of European largest industrial group Siemens AG is headquartered on Brande, Denmark. The company provides wind power solutions for onshore, offshore and coastal sites. The company was founded in 1980 as Bonus Energy A/S and changed its name to Siemens Wind Power A/S when taken over by Siemens AG in 2004 (Bloomberg Research 2015b).

Siemens AG strategy is to focus on company positioning all along the value chain of electrification. It includes power generation, power transmission, power distribution, smart grid, efficient application of electrical energy and interrelated fields such as electrification, automation and
digitization. Siemens describes that key part of its strategy is the worldwide integrated go-to-market setup (Siemens 2015a) Siemens AG includes also Siemens Financial Services – a subsidiary offering business-to-business project and structured financing as well as leasing and equipment finance (Siemens 2015b).

Siemens Wind Power A/S is part of Siemens AG Power generation division. Siemens Wind Power A/S offers onshore and offshore wind turbines based on both, geared and direct-drive technologies. They focus on innovations in blade design and generator technology. In manufacturing process, their strategy is to apply systematic modularization that allows the company to streamline the manufacturing and installation process (Siemens 2015c). The strategy is based on the automotive industry's practice of modular components mass production (Backwell 2014).

Siemens Wind Power A/S wind turbine outputs ranges from 2,3 – 3,2 MW onshore turbines and 3,6 MW to 7 MW offshore turbines.

**Siemens strategy classification**

Siemens describes its Wind Power and Renewables division's strategy as follows: “The Wind Power and Renewables Division is a leading supplier of reliable, environmentally-friendly and cost-efficient renewable energy solutions. Driving down the cost of wind power is our key target as we strive to make renewable energy fully competitive with conventional energy sources (Siemens 2015d). ”The focus on lowering costs is also pointed out by Siemens Wind Power CTO Henrik Stiesdal (CleanTechnica 2013). Taking also into account the focus on systematic modularization the Siemens Wind Power's strategy could be classified as a cost leadership type generic strategy.

### 4.2.4 Senvion

Senvion SE (formerly REpower Systems SE) is a Germany based wind turbine manufacturer headquartered in Hamburg. Senvion is a non-listed company owed by private equity firm Centerbridge Partners L.P. who purchased the shares from Indian group Suzlon Energy Limited (Senvion 2015a).

Senvion strategy is to offer onshore and offshore wind turbines with wide range of power output parameters and high level of standardization. The portfolio consists of three product lines, all using geared wind turbine concept: 6,2 MW installed onshore an offshore and 3MW and 2MW designed for onshore wind parks. In addition to that Senvion offers turnkey projects and wind parks operation services.

**Senvion strategy classification**

Senvion describes the company's vision to offer highly reliable wind turbines at a competitive price/performance ration. Senvion deliminates the company's strategy by not seeking radical innovations as objective, but to focus on continuous improvements of wind turbine technology and take advantage of the market growth (Senvion 2015b). The clear price orientation of the strategy and limited innovation strategy, as well as fact that Senvion manufactures only geared turbines reflect that company's strategy could be classified as overall cost leadership generic type.
Gamesa Corporación Tecnológica (Gamesa), formerly Grupo Auxiliar Metalúrgico is a Spanish wind turbine manufacturer. Gamesa is listed at Madrid Stock Exchange. Gamesa has installed more than 30 GW in 50 countries. Gemasa offers wind turbine operation and maintenance service to more than 20 GW wind turbines. Gemasa as production centers in the main wind markets Spain and China as the global production and supply hubs. Local production capacity is located also in India, US and Brazil (Gamesa, 2015a). Gamesa has been strategic partner for World largest wind developer, Spain utility Iberdrola. Iberdrola is also Gamesa’s biggest shareholder (Backwell 2014, Gamesa 2011).

Gamesa product range is divided into two platforms: 2,0 – 2,5 MW and 5.0 MW. Both are geared onshore wind turbine platforms. (Gamesa 2015b). Gamesa also develops 5 MW offshore platform in joint venture with Areva (Gamesa 2014).

**Gamesa strategy classification**

Gamesa strategy “Business Plan 2013-2015” is developed taking into account the market downturn in 2012. The strategy focuses on four areas:

- recovering and maintaining profitability, reducing fixed and variable costs (structure size and an industrial and procurement strategy), while maintaining the flexibility needed to continue growing. The product strategy is based on components standardization allowing for multiple use in all wind class products;
- strengthening the balance sheet by reducing debt (control of working capital and capex),
Gamesa's production and supply strategy is focused on operational excellence and optimization of variable costs. This includes standardization of components and manufacturing processes. Gamesa strategy states that the company will maintain its global supply chain (Gamesa 2015c).

Product portfolio consisting of range of geared onshore and offshore wind turbines, strategic focus on reducing fixed and variable costs through modularization of components reflects that Gamesas strategy could be classified as overall cost leadership generic type. More over, the classification is supported by the fact that cost reductions are much more stressed than research and development in the strategy documents. However, strategic partnership with utility company Iberdrola adds also focus type strategy's features.

### 4.2.6 Nordex

Nordex SE is a wind turbine manufacturer headquartered in Rostock, Germany. Nordex is listed at Frankfurt stock Exchange since 2001. Nordex develops, produces, installs and maintains wind turbines. Nordex also develops wind turbines blades and control systems. Nordex was founded in 1985 in Denmark. Nordex has installed over 5500 wind turbines to 34 countries with a total rated output of over 10,7 GW (Nordex 2015a).

![Nordex share performance 2005 - 2015](Bloomberg Research 2015d)
Nordex produces geared onshore wind turbines ranged from 2.4 MW to 3.3 MW (Nordex 2015b). Nordex is able to produce wind farms as a turnkey project. Nordex describes itself as a mostly Europe oriented company able to ship parts from their Rostock within 24 hours.

In 2011 Nordex planned to develop 6 MW direct drive offshore wind turbine and enter to the offshore market segment (Nordex 2011). But due do not finding agreement with development partners, year later Nordex decided to discontinue the offshore direct drive wind turbine development and focus on its core businesses – onshore wind turbines and services (Nordex 2012).

**Nordex strategy classification**

Nordex defined its new corporate strategy in late 2012. Nordex strategy is to concentrate on onshore geared wind turbines. Although geared wind turbines is older technology than direct drive Nordex states they are using only the solutions that are already proven itself and their policy is not to implement technical changes during operations. Nordex strategy is based on four foundations:

- as broad access as possible to the relevant markets;
- the technical skills needed to develop and produce competitive wind turbines;
- a good cost position making it possible to offer products and services at internationally competitive prices. The focus on good cost position includes Nordex applying methods “deigned-to-cost” and “designed-to-value;
- solid funding as a basis for ensuring the necessary confidence of customers and banks in the Company.

Nordex focuses on medium-size customers and large scale utilities are no longer the main target group.

The focus on low cost methods such as “designed-to-cost” and favoring older geared wind turbine types over developing more advanced direct drive types reflects that Nordex's strategy could be classified as closest to overall cost leadership type generic strategy.

**4.2.7 Mervento**

Mervento OY is an emerging wind turbine developer located in Vaasa, Finland. Mervento provides multi-megawatt direct drive wind turbine power plant solutions for near-shore and offshore applications also in cold-weather conditions. Currently Mervento is at the stage where they have a full scale prototype of 3,6 MW direct-drive wind turbine up and it is running since 2012, but they have no customers and deliveries. However, Mervento sees its customers primarily as developers, utility companies and independent power producers initially in Finland, Sweden, Norway, UK, Ireland and France (Mervento 2015).

As Mervento is focusing on delivering technically more advanced wind turbines than its competitors company's strategy could be classified as closest to differentiation generic type strategy.
4.2.8 Wind turbine product crossover table

Wind turbine product crossover characteristics are presented with the following tables, for onshore and offshore wind turbines respectively:

**Table 3: Onshore wind turbines**

<table>
<thead>
<tr>
<th></th>
<th>Geared</th>
<th>Direct drive</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Vestas</strong></td>
<td>1,8 MW; 2 MW; 3,3 MW; 3,45 MW</td>
<td>-</td>
</tr>
<tr>
<td><strong>Enercon</strong></td>
<td>-</td>
<td>0,8 MW; 0,9 MW; 2 MW; 2,3 MW; 3 MW; 3,5 MW; 4,2 MW; 7,5 MW</td>
</tr>
<tr>
<td><strong>Siemens</strong></td>
<td>2,3 MW</td>
<td>3,0 MW; 3,2 MW</td>
</tr>
<tr>
<td><strong>Senvion</strong></td>
<td>1,8 MW; 2,0 MW; 3,0 MW; 3,2 MW; 3,4 MW; 6,2 MW</td>
<td></td>
</tr>
<tr>
<td><strong>Gamesa</strong></td>
<td>2,0 MW; 2,5 MW; 4,5 MW; 5 MW</td>
<td>-</td>
</tr>
<tr>
<td><strong>Nordex</strong></td>
<td>2,4 MW; 2,5 MW; 3,0 MW; 3,3 MW</td>
<td>-</td>
</tr>
<tr>
<td><strong>Mervento</strong></td>
<td>-</td>
<td>3,6 MW</td>
</tr>
</tbody>
</table>

**Table 4: Offshore wind turbines**

<table>
<thead>
<tr>
<th></th>
<th>Geared</th>
<th>Direct drive</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Vestas MHI</strong></td>
<td>3,3 MW; 8,0 MW</td>
<td>-</td>
</tr>
<tr>
<td><strong>Enercon</strong></td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>Siemens</strong></td>
<td>3,6 MW; 4,0 MW</td>
<td>6 MW</td>
</tr>
<tr>
<td><strong>Senvion</strong></td>
<td>6,2 MW</td>
<td>-</td>
</tr>
<tr>
<td><strong>Gamesa</strong></td>
<td>5 MW</td>
<td>-</td>
</tr>
<tr>
<td><strong>Nordex</strong></td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>Mervento</strong></td>
<td>-</td>
<td>3,6 MW</td>
</tr>
</tbody>
</table>

The tables show that the intensity of rivalry is higher in the field of geared wind turbines while only Enercon, Siemens and Mervento manufacture direct drive turbines. Rivarly in the market of offshore and onshore turbines can be considered approximately equal.
5 Findings and discussion

This section presents the qualitative and deductive analysis – implementation of the competitive strategy theory on wind turbine market data and competitors. The analysis is presented in the form of tables and argumentative discussion.

5.1 Structural determinants of the intensity of competition at wind turbine market

5.1.1 State of competition

Threat of entry

Possible threats of entry are presented as the following table:

<table>
<thead>
<tr>
<th>Barriers</th>
<th>Effect</th>
<th>Arguments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Economies of Scale</td>
<td>Barrier</td>
<td>As the sector is dependent on a large scale research and development, economies of scale is a barrier to entry. Moreover, wind turbine sector is moving towards the logic of automotive sector and hiring automotive sector managers (Backwell 2014). Automotive sector is subject of economies of scale – another possible entry barrier in the industry.</td>
</tr>
<tr>
<td>High Capital Requirements</td>
<td>Barrier</td>
<td>Wind turbine threat to entry is determined by high capital requirements, as wind turbines are relative complex and expensive products. Vestas onshore turbines costs around 1 million Euros per installed megawatt. Siemens Wind Power offshore turbines costs around 1,2 million Euros per installed megawatt (Smith 2015).</td>
</tr>
<tr>
<td>Switching Costs</td>
<td>Not a considerable barrier</td>
<td>Switching costs are not the entry barrier because most utility companies are using a mix of different producers wind turbines to mediate the risk of one supplier and suppliers bargaining power.</td>
</tr>
</tbody>
</table>


### Table 5: Possible threats of entry to the wind turbine manufacturing industry

#### Intensity of rivalry among existing competitors

Existing competitors' rivalry is considered intensive if the following characteristics apply:

| Numerous of Equally Balanced Competitors | Yes | The wind turbine manufacturing market is not dominated by a single or a couple of companies. |
| Slow Industry Growth | No | The annual market growth is foretasted as 3.7 – 6.8 percent for next five years and 2 GW to 4.2 GW in terms if installed capacity (GWEC 2014). |
| High Fixed Storage Costs | No | Most of the sector is based on horizontally integrated business model. On-site assembly is used where possible. By introduction of first moving wind turbine production line by Siemens and flow production the assembly time per nacelle has reduced to 19 hours (Backwell 2014). |
Lack of Differentiation or Switching Costs
No Wind turbines production output is a commodity.

capacity Augmented in Large Increments
No The industry is mainly based on horizontal integration,

Diverse Competitors
Yes There are companies on the market who are solely concentrated on wind turbines such as Vestas and Enercon and wind turbine producers who are part of large multinational companies such as Siemens and GE.

High Strategic Stakes
Yes For multinationals such as Siemens, wind turbine manufacturing is minor part of all the business. On the other hand, there are companies on the market such as Vestas and Enercon who are specialized only on wind turbines (Backwell 2014).

High Exit Barriers
No Wind turbine producers have been sold and bought and it is possible to exit the business by selling the venture to a competitor or to a multinational engineering company.

Table 6: Rivalry among existing competitors in wind turbine manufacturing industry

Pressure from substitute products

Solar panels could be considered direct substitute products. But wind turbines, particularly onshore wind turbines will offer the lowest cost per MW installed power. Solar panels are combined with wind turbines to build combined power plants and therefore two technologies complement each other. Solar panels role is to compensate volatility of wind turbines output. (Backwell 2014).

Shale gas and LNG could be competitor in non-OECD countries where wind power installation is not driven by governmental policies but need to extra power addition to the grid. But this could not be considered as a direct substitute product to wind turbines industry as the cost structure has major differences. Moreover, wind power and electricity generated from natural gas, such as LNG could be used similarly as solar power to compensate volatility of wind turbines output. Shale gas technologies and LNG could be the slip-sheet between fossil fuels and renewable energy (Zuckermann 2013).

Therefor we can say, that there is not such a strong pressure from substitute products that could be considered as a factor from the point of view of entry to the wind turbine industry. The technologies such as solar panels and natural gas that could be considered as substitutes however complement wind power and vice-a-verse.
**Bargaining power of buyers**

Buyer group is powerful if the following circumstances hold true:

<table>
<thead>
<tr>
<th>Condition</th>
<th>Status</th>
<th>Reason</th>
</tr>
</thead>
<tbody>
<tr>
<td>Its is concentrated or purchased large volumes relative to seller sales</td>
<td>Yes</td>
<td>At growing phase, the emerging wind turbine manufacturer may have only one or two customers.</td>
</tr>
<tr>
<td>The products it purchases from the industry represent a significant fraction of the buyer's costs of purchases</td>
<td>Yes</td>
<td>Wind turbines are main assets of utilities operating wind turbines or wind turbine divisions of larger utility companies.</td>
</tr>
<tr>
<td>The products it purchases from the industry are standard of undifferentiated</td>
<td>Yes</td>
<td>Production output of utility companies is a commodity.</td>
</tr>
<tr>
<td>It faces few switching costs</td>
<td>Yes</td>
<td>Utility companies tend to have a mixed range of wind turbines.</td>
</tr>
<tr>
<td>It earns low profits</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>Buyers pose a credible threat of backward integration</td>
<td>No</td>
<td>Utility companies do not manufacture the wind turbines on their own.</td>
</tr>
<tr>
<td>The industry's product is unimportant to the quality of the buyers product or services</td>
<td>No</td>
<td>It is important for the buyer the wind turbine to be reliable and do not have downturns.</td>
</tr>
<tr>
<td>The buyer has full information</td>
<td>No</td>
<td></td>
</tr>
</tbody>
</table>

*Table 7: Bargaining power of buyers in wind turbine industry*
Bargaining power of suppliers

A supplier group is powerful if the following characteristics apply:

| It is dominated by a few companies and is more concentrated than the industry it sells to | No | The supplier groups of most of wind turbines inputs are not concentrated |
| It is not obligated to contend with other substitute products for sale to the industry | No |
| It is dominated by a few companies and is more concentrated than the industry it sells to | No | The supplier groups of most of wind turbine inputs are not concentrated |
| It is not obligated to contend with other substitute products for sale to the industry | No |
| The industry is not an important customer for the supplier group | No | The industry is usually an important customer for the supplier group. |
| The suppliers product is an important input to the buyers business | Yes |
| The supplier group’s products are differentiated or it has built up switching costs | Yes |
| The supplier group poses a credible threat of forward integration | No |

Table 8: Bargaining power of suppliers in wind turbine industry

5.2 Wind turbine manufacturing industry's position in the industry's life cycle

Following to the downturn in 2013, wind turbine industry has started to take over disciplines from automotive industry. The movement involves taking over methods from the automotive industry and hiring executives from automotive in order to change focus to cost control. As market leader's
Vestas Chairman of Board of Directors Bert Nordberg says in company's annual report 2014: “We are in a strong position to drive the business forward and with that reduce the cost of energy and ensure an attractive return on investment for our shareholders.” (Vestas 2015c, pp 3) With that Nordberg expresses that cost control is a top priority in Vestas's strategy for upcoming years.

Vestas and Gamesa have used this approach. Vestas has also searching ways to outsource or make joint ventures, like it formed with Mitsubishi Heavy Industries for offshore wind turbines development (Backwell 2013)

The industry's growth and structure has stabilized (GWEC 2014). Thus, we can say, that the wind turbine industry is in a transition process from growth phase to maturity phase.
6 Competitive strategy for an emerging wind turbine manufacturer

According to the competitive strategy research of this thesis, it is possible to enter to the wind turbine manufacturing industry. The strategy to enter to the wind turbine manufacturing industry is based on five following strategic decisions – trade-offs:

1. Direct drive technology concept

Direct drive technology provides more robust and reliable wind turbine design than traditional geared design. The success of Enercon has shown that direct drive technology is economically highly competitive. Direct drive concept creates a new experience curve within the wind turbine industry beside the geared turbines experience curve. To position the emerging firm to the new experience curve creates a leapfrog and provides competitive advantage over the firms that are positioned on the traditional wind turbine technology – geared design experience curve.

Moreover, innovations in direct drive wind turbine technology, if protected as intellectual property, could provide competitive advantage over the companies on the direct drives wind turbine experience curve. Improvements in increasing direct drive wind turbines reliability and resistance towards wind can create the core offensive competitive advantages over which to built the focus type strategy.

2. Onshore focus

While most of the wind turbine industry’s companies are turning their research and development resources to offshore wind turbine technologies, the tradeoff to a company entering the industry is to position itself to onshore. Despite high attention to offshore sector, onshore sector is still predicted to be approximately 10 times larger. Onshore wind power continues to be the cheapest technology to add new capacities to the grid. Because core of market penetration strategy is a technological advantage increasing efficiency, this tradeoff positions the company to segment where is level of competition in the field of innovation is lower.

3. Forward integration

Existing well established relationships between wind turbine manufacturers and utility companies is a major barrier to entry. Particularly in case of engineering corporations such as Siemens that have relationships with the utilities in wider areas. Also, new companies do not have sufficient references to get wind turbine fields using their technology financed by investors and insurance companies involved. The strategy to penetrate this barrier is to integrate forward – establish a strategy for developing wind parks by themselves. This provides the emerging company initial references to compete on the market. The wind turbine manufacturers own wind park is also a test-bed for developing new types. The key part enabling to execute this part of the strategy is the fact that the production output of wind parks, electricity is traded as commodity and there are no major barriers to sell it on the market prices.
4. Europe – home market

The company focuses on Europe's market as its home market and first market to enter. Europe is predicted to show steady growth. The estimation is based on the European Commission's objective that by 2020 20% of the final energy consumption comes from renewable sources. Although political risk is a major concern, particularly retroactive and retrospective chances to regulatory market, the risk is lower than at other major markets.

Another advantages of European market include lower regulatory risk, lower risk of access restrictions and geographical vicinity. The latter arguments have particular importance enabling to implement the forward integration part of the strategy.

5. Core competences

Core competences for the emerging company include product engineering and quality management. Strong coordination among functions in research and development, product development and marketing is essential to build up a reputation of reliable wind turbines producer company. Marketing focus is technological advantages and reliability of the products.

The production follows a horizontally integrated model. On-site assembly is used to mediate the market barrier that capital is augmented in large quantities as well as to shorten the manufacturing process. Operational excellence, however, is not a strategic trade of, but a mandatory part of a company.
7 Conclusion and further research

The main result of this thesis is that there are still windows to enter to the wind turbine manufacturing industry despite the fact that the industry is about to reach its maturity stage.

Based on competitive strategy research, a window to enter to wind turbine manufacturing industry is embedded into the process of establishing a new experience curve based on direct drive wind turbine concept. While lion-part of major wind turbine manufacturing companies are shifting their attention to offshore wind turbines development, the market of direct drive onshore wind turbines is dominated by one company. Because onshore wind turbines account still vast majority of the market, creating a new experience curve to this segment is a strategy for newcomers to leapfrog into the industry.

A major barrier entering the industry is well established relationships between old wind turbine manufacturers and customers – utility companies. Because new companies do not have sufficient references they are not competitive at the tenders. A strategy to hurdle the barrier is acquiring the references by forward integration. To enter to the market, wind turbine company should own its own wind park as a base of references and new product testing. As wind parks' product, electricity is a commodity and sold on a commodities market, the know-how needed to set up and operate a wind park do not require wind turbine manufacturer to acquire new knowledge. Moreover, most of wind turbine manufacturers have capacity to execute turnkey projects and operate wind parks. Because of this competitive situation, having this capacity is a critical success factor at the wind turbine market's - competition forces companies to have this know-how even without the need for forward integration strategy.

Further research on this field could include developing the market entrance strategy further based on needs of concrete utility companies. The development should be carried out by using bottom-up, repeated customer interaction oriented approach such as Ries' (2011) Lean Startup. The expected result is set of recommendations on technology development and business model level.
8 References


