VAASAN AMMATTIKORKEAKOULU
VASA YRKESHÖGSKOLA
UNIVERSITY OF APPLIED SCIENCES

Yu Xie

GLOBAL EXPLORATION OF COOPERATIVE OWNER MODEL IN WIND ENERGY PRODUCTION

Business Economics and Tourism
2011

ACKNOWLEDGEMENT

I would like to give thousands of thanks to my supervisor, Mr. Ossi Koskinen, who assisted my writing process all the way. He has also guided me to sort out the research idea and helped me a great deal in designing the research survey. Furthermore, he was very patient in directing each step of my work and providing valuable suggestions. The thesis would never be accomplished without his help. I also want to thank my dear friend, Danna Hu, Quan Xueying. Thank you for helping me a lot and encourage me.

VAASAN AMMATTIKORKEAKOULU
Koulutusohjelman nimi

TIIVISTELMÄ

Tekijä	Yu Xie
Opinnäytetyön nimi	Global Exploration of Cooperative Owner Model in Wind Energy production
Vuosi	2011
Kieli	Finnish
Sivumäärä	77
Ohjaaja	Ossi Koskinen

Tuuli yhtenä uusiutuvana, puhtaana ja ilmaisena energiamuotona on liikkuvien ilmamassojen muuttamista hyödyntämistä pääasiassa sähkön tuotannossa. Tuulivoimalla on valtaisa liiketoimintapotentiaali ja sen suosio on kasvanut merkittävästi viime vuosina. Yksi tuulivoiman omistusmuoto on yhteisöllisesti omistettu tuulivoima, joka yleensä tapahtuu tuuliosuuskunnan tai siihen rinnastettavissa olevan yhteenliittymän puitteissa. Tuuliosuuskunta on demokraattisesti toimiva yritysmuoto, joka tuottaa taloudellista etua jäsenilleen. Tutkimuksen tavoitteena on selvittää kuinka tuuliosuuskunnat ovat toimineet eri maissa ja tätä kautta hakea tietoa suomalaisten tuuliosuuskuntien perustamiseen.

Tutkimuksessa lähetettiin yli sadalle ulkomaalaiselle tuulivoimataholle kysely liittyen yhteistöomistukselliseen tuulivoimaan. Vastauksia tähän web-kysylyyn saatiin uusintasähköposteista huolimatta kohtuullisen vähän, jolloin saadut vastaukset analysoitiin syvällisesti ja näistä pyrittiin vetämään johtopäätökset kuinka yhteisöllisesti omistettu tuulivoima toimii eri maissa. Tutkimuksessa havaittiin, että maakohtaisten tuulivoimatukimuotojen lisäksi erittäin keskeistä roolia toiminnassa näyttelee erilaiset verotekniset kysymykset. Eri maiden verokäytännöt ovat ohjanneet merkittävästi maan tuulivoimateollisuuden kehittymistä ja erityisesti niillä on ollut vaikutusta yhteisöllisesti omistettujen tuulivoimaloiden yritysmuotoihin.

Saaduissa vastauksissa ulkomaalaisilta toimijoilta korostui tuuliosuuskunnan yhteistoiminnan tärkeys ja keskeisyys sekä paikallisen kunnan että myös kunnan asukkaiden kesken. Yhteisöllisesti omistettu tuulivoima lisää tuulivoiman yleistä hyväksyttävyyttä ja edesauttaa näin ollen merkittävästi myös isompien tuulivoimayhtiöiden toimintaa.

Avainsanat Tuulienergia, osuuskunta,

VAASAN AMMATTIKORKEAKOULU
UNIVERSITY OF APPLIED SCIENCES
International Business

ABSTRACT

Author	Yu Xie
Title	Global Exploration of Cooperative Owner Model in Wind Energy production
Year	2011
Language	English
Pages	77
Name of Supervisor	Ossi Koskinen

Wind power, as one of the renewable resources, is the conversion of wind energy into a useful form of energy. With the advantages of unlimited resource, clean, and free, wind energy has become more and more popular in recent years. Wind energy has a huge business potential in the energy consuming market. In the last decade, the market for utility- scale wind energy systems is rapidly expanding. A wind energy cooperative is a jointly owned and democratically controlled enterprise that follows the cooperative model, investing in wind turbines or wind farms. This kind of business model is simple, flexible, efficient, and reliable which is good for a wind business.

The readers of this paper will gain a good understanding on wind energy and cooperative business model, a close view at how the wind cooperative operates, how they collect money, distribute benefits, and also, a detailed knowledge about the different wind cooperative models in different countries.

This thesis discusses the problem how cooperative owner model in wind energy production has been globally exploited. In order to achieve this goal, the writer uses in-depth analysis in this study as the main research method. By utilizing and analysing the primary data collected from the feedbacks which are delivered by six respondents running their wind energy business under the community owned business model from four different countries, the writer draws a conclusion at the end of this thesis.

The result of the study shows that these different wind community business models are developed by utilizing the legislation support, taxation support, capital support, and production support provided by the government, which differ from country to country.

At the end of the thesis, the writer also makes suggestion for the future Finnish wind communities: cooperate with the local communities all the time at all levels and keep high acceptance with wind energy are the key points for a wind community to succeed.

Keywords wind energy, cooperative, wind community/ cooperative

CONTENTS

LISTS OF PICTURES, GRAPHS AND TABLES

LIST OF APPENDICES

1 INTRODUCTION

1.1 Objective of Study

The term “energy resource”, was rarely talked about in the past. Due to the two times of oil crisis (1973 and 1979), the global energy problem became a hot issue that concerns the world. Energy resources, as the basis and guarantee of the development of modern industry, are the most important things for economic growth. Since the industrial revolution, under the support of the stable energy resources supply, the world economy developed rapidly. However, when we enjoy the modern life economic growth, science and technology progress bring to us, we also face the challenges of energy security, shortness of energy, energy resources contention, and not to mention the environment pollution due to the overuse the limited energy resources, which is now threatening our human beings living environment. The traditional energy resources are running out, we need new energy.

Wind power, as one of the renewable resources, is the conversion of wind energy into a useful form of energy, such as using wind turbines to make electricity, wind mills for mechanical power, wind pumps for pumping water or drainage, or sails to propel ships (Bangladesh Alternative Energy System Pvt. Ltd., 2010). Wind energy is abundant for every country. It is unlimited, clean and it can reduce the greenhouse effect. As the pollution-free and renewable energy resource, wind energy has a great development potential.

In recent years, the cost of generating electric power produced by wind turbine is much lower than before. Without considering the external and potential cost of building wind power plant, in many areas it is cheaper to use wind turbine for generating electricity than use the traditional internal-combustion engine or gas engine to get electricity (Wikipedia: Energy development, 2011).

Along with the technology development in energy industry, the consuming of wind power grows rapidly. In the year 2002, the average annual rate of growth of wind power generation is about 25%, and now it is growing at the rate of 38%.

In this study, I will explore the global business potential and cooperative business models of wind energy production.

1.2 Research Problems and Questions

In this study, the author aims to explore how the cooperative owner model in wind energy production has been globally exploited.

In order to achieve this goal, the four research questions need to be answered:

1. In which countries are there wind energy cooperatives?
2. How the cooperative model has been utilized (How is capital collected, how are profits divided etc.)?
3. What are the pros and cons that foreign actors have experienced concerning the cooperative business model?
4. What can we learn from foreign experiences when importing the cooperative model to Finnish wind energy industry?

1.3 Thesis Structure

The first chapter of the thesis will give an overview of the study. It will introduce the objective of the study and the research problems and questions to the readers.

The second chapter will be divided into three parts: wind energy, cooperative business model and wind cooperatives. It will start with introducing the concept of cooperative to the readers.

The third chapter will be the analysis of the survey. We will find out the solution to the research problem.

The fourth chapter will be the last chapter of the thesis, which will conclude the whole study and provide suggestions to the fourth research question.

2 THEORETICAL PART

The theoretical part includes three parts. The first one is cooperative, which contains the definition of “cooperative”, the history movement of cooperative, and the advantages of running a business under the cooperative business models. In the second part I will introduce wind energy to the readers. The reader will get basic knowledge and information about wind energy, its economic and business potential in the energy industry. In the third part, I will explain some typical wind cooperative models in the world, and how community owned wind operates in Germany, Sweden, Denmark, the United States, and the Great Britain.

2.1 COOPERATIVES

For many people, “cooperative” is an unfamiliar word or just have a vague concept about it. In this part, I will introduce what a cooperative is and why does it play an important role in business models.

2.1.1 What is Cooperative?

Cooperative is one of the natures of human beings. When we see a child falls down on the ground, we will naturally want to help him get up. Since David Ricardo published his competitive advantage theory in 1817, we began to be aware of that everyone has his own competitive advantage. Nobody is able to do everything well, and neither of us can do things at the same time. Frequently, we have to give up something to achieve another, however, if we cooperate with each other, we can take advantage of what we are good at to make goals easier to achieve.

In economics, a business cooperative can be defined as a business organization formed and owned by a group of individuals for their mutual benefit (Sheffrin, 2003). Cooperatives are defined by the International Cooperative Alliance's

Statement on the Cooperative Identity as autonomous associations of persons united voluntarily to meet their common economic, social, and cultural needs and aspirations through jointly owned and democratically controlled enterprises (International Co-operative Alliance, 2010). It is an organization owned by its members and the members have the authority to decide the value of the organization, the strategy, how to distribute the return surplus revenues, who will be elected as the manager etc. The cooperatives are autonomous organizations. They are independent from the government and private owned enterprises. The cooperative business is a different way and an efficient way in doing business. Instead of competition, there is only cooperation within cooperatives.

Cooperatives have open membership, which means everyone can join the cooperative. The members in a cooperative have the same common goals, values, principles, and enjoying in sharing their work, idea, resources, profits and surplus. The members have the rights to make decisions.

2.1.2 Origin of Cooperative

Cooperation dates back as far as human beings have been organizing for mutual benefits (Wikipedia: Cooperative, 2011). Since the primitive society, people began allocate jobs and resources among each other. They divide the labors, men hunting for food and women weaving and taking care of the olds and children.

In modern times, Europe is the origin of the cooperative movement, primarily in France and Britain. In 1473, Fenwick Weavers' society was formed. The weavers in Fenwick village wanted to build a society in which they could share weaving skills and experience to foster high standards in the weaving craft, but later expanded to purchase food, living necessities, and books for its members at a lower price. This practice of collective purchasing for the benefit of members has led many to consider Fenwick Weavers' Society the first cooperative. (John, 2002)

Then in 1810, Robert Owen, who was considered the father of the cooperative movement, was the first one who spread the idea "village of cooperation" to others. Owen believed that if his worker has a good working environment and receive

some education they will work more efficiently. He opened a school and food store which makes his workers' living more convenient. Owen's success spurred the others, village of cooperation became popular. (Wikipedia: History of the co-operative movement)

The most important society in the cooperative movement is The Rochdale Pioneers. The Rochdale Pioneers was a group of 28 weavers and other artisans. As the industrial revolution bloomed, many skilled weavers lost their jobs. These weavers decided to band together to get through this. They formed a food store so that the villager did not have to go to another village to purchase food. They know there were many cooperation failed at last and they learn from the others' failure. (Regents of the University of Michigan, 2011) Finally they came up with and designed the mow famous Rochdale Principles which is adopted by the International Co-operative Alliance as their main principles. The Rochdale Principles includes (Co-operative College, 2010):

- Open membership.
- Democratic control (one person, one vote).
- Distribution of surplus in proportion to trade.
- Payment of limited interest on capital.
- Political and religious neutrality.
- Cash trading (no credit extended).
- Promotion of education.

Nowadays, cooperative organizations are very popular. We can see cooperation everywhere in the world and it becomes one of the most important and efficient business model. In many EU countries, cooperative institutions have a predominant market share in the retail banking and insurance businesses.

2.1.3 The Advantages of Cooperatives

It was mentioned in the former text that cooperative is a business organization or a society formed by individuals who have the common goals to achieve their mutual

benefits. So, a cooperative works only if people participate. Why do cooperatives attract people to join them and act with each other? That is because a cooperative has its advantages that everybody in the cooperative can benefit from. The advantages of a cooperative can be divided into two parts-for the business and for the society.

For the business, first of all, a cooperative can help single people or companies achieve their goals which they cannot accomplish on their own. Co-ops help people obtain goods and services that they may not otherwise be able to afford on their own. (OurFernie coop, 2010) There is an old story in China that one chopstick can be broken easily, but if you put 10 chopsticks together, it is hard to break them. The story told us the power of one person is limited, but if we unite others, cooperate with others, we will be much stronger and can do more than we can imagine.

The members in a cooperative are equal. Cooperatives are open to everyone and not regard to the members' social status, income, so each member have an equal vote right. A cooperative is totally democratic. It is owned and controlled by its members, so the profit of a cooperative and the benefit of an individual are bonded together. Because of this character of a cooperative, the cooperatives are often running efficiently-members in the cooperatives work for their own, the better the cooperative is running, the more benefits they can get from it.

In a cooperative, the middleman is eliminated which reduces the cost. A consumer cooperative purchases finished goods from the manufacturers and producers. A producer cooperative purchases raw material from its certain suppliers at a lower price. The members get these goods and materials at a lower price with lower costs (management, logistic, storage etc.) which make them more competitive in their market.

Co-ops are more stable and durable than private businesses. The survival rate of co-ops after 5 years is 64% as compared to 36% for private firms. After 10 years, the survival rate of co-ops is 46% compared to 20% for private firms. (OurFernie coop, 2010)

A cooperative generates the scale economic effect. After companies in the same industry join together, they will form a larger organization which is bigger than any of its members. The advantage of this is that the former competitors become cooperative partners and they unite together to compete with the other enterprises in their industries. They share their customer resources, suppliers, technology, and information. It is easier for them to bargain with their supplier to get a lower price, negotiating the selling price, distributing the raw material, managing the storage, allocating the orders which can also reduce their costs. There are factors that cause a producer's average cost per unit to fall as the scale of output is increased.

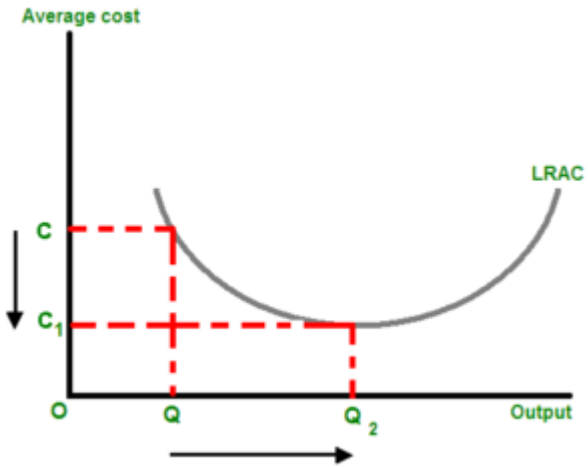

Figure 1, Economic Scale (Wikipedia: Economic of Scale)

We can see in the figure that as quantity of production increases from Q to Q2, the average cost of each unit decreases from C to C1.

Cooperatives also contribute to the society. Cooperatives help build a stronger community. As cooperatives are mostly regional, community based the investment in, and surplus revenue from the co-op stay within the local community. Every dollar invested in the local co-op, has a significant multiplier effect within the community. (OurFernie coop, 2010)

2.2 Wind Energy

For years, there has been rumors about that the oil storage of the world is low which the volume can only provide us for less than 100 years. And, recently, we heard about that coal and natural gas are also running out. In addition, one of the new and our major energy resource, nuclear power are dangerous. The Russian Chernobyl nuclear power station explosion and the Japanese nuclear radiation reveal that nuclear power is not as safe as the experts said. Then what does the earth leave for us -the natural and renewable resource, which can never be used out, wind.

2.2.1 Introduction of Wind Energy

Wind is everywhere at any time. We do not have to seek for wind resource. What we have to do is just to find a proper place, establish a certain machine, which can transfer the natural wind power to what we can use- electricity. The most common machine in recent years is the wind turbine, which can convert wind energy into electricity. There are also other machines, such as we can use wind mills for mechanical power, in Netherland, which formed a sigh line; we can use wind pumps for pumping water, it is often used in desert area as there is enough wind but water is under ground.

Wind power has been used for centuries. It dates back to the first time human sail. For more than two millennia wind-powered machines have ground grain and pumped water. Wind power was widely available and not confined to the banks of fast-flowing streams, or later, requiring sources of fuel. Wind-powered pumps drained the polders of the Netherlands. In arid regions such as the American midwest or the Australian outback, wind pumps provided water for livestock and steam engines. (WPS Construction, 2011)

With the development of electric power, wind power found new applications in lighting buildings remote from centrally-generated power. Throughout the 20th century parallel paths developed distributed small wind plants suitable for farms or residences, and larger utility-scale wind generators that could be connected to

electricity grids for remote use of power. Today wind powered generators operate at every size between tiny plants for battery charging at isolated residences, up to multi-megawatt wind farms that provide electricity to national electrical networks.

Wind energy, now as an alternative energy to fossil energy, has its own advantages (V. Ryan, 2009):

- Wind energy is clean. The resource of wind energy is wind, a natural phenomenon. The nature of wind energy makes it is harmless to the environment.
- The facilities of wind energy just take a small space. Wind turbines are so small comparing to other forms of generating electricity facilities so that the land around wind turbines can be used for many purposes, such as for farming.
- The economic potential of wind production is large. Wind is free for everyone, which means except for the cost of the establishing and maintenance of the facilities, the resource of this type of energy won't cost a penny.

In some areas, the cost of wind energy is much lower than traditional energy. For example, in mountain communities and the remote countryside, if they can produce electricity by their own, the government can save a lot of money to connect these areas to the main electric power transmission network.

2.2.2 Development of Wind Energy

Wind, as an energy resource, has been used for thousands of years. Historically, people use wind includes sails for ship propulsion and windmills for grinding grain and pumping water. Wind is still used today as a source of power for sailing vessels and parasailing (John R. Fanchi, 2011, 148).

The earliest known application of wind as an energy resource comes from Persia (Manwell, 2002). It is around 900 A.D that wind was used to drive early vertical axis windmills (John R Fanchi, 2011, 148). In the modern times, wind turbine can be divided into two types, the horizontal axis, and the vertical axis turbines. But in the ancient period, the most popular wind mills had vertical axes and were drag type devices. They were inefficient and were easy to be broken in hard winds.

Wind energy made its appearance in Europe during the middle Ages. These type of windmills all had horizontal axes and were used for any mechanical task, such as water pumping, grinding grain, sawing wood, and powering tools. (Manwell, 2002, 11) Those types of windmills are built on a post which made the entire mill could be turned to face the wind blowing in any direction. Figure 2 illustrates a typical European windmill.

Figure 2, Old-fashioned windmill in Europe.

During the industrial revolution time, wind maintained its reign as a major source of energy in Europe, but began to recede after that time. The reason that wind energy began to disappear is primarily attributable to its non-dispatchability and its non-transportability (Manwell, 2002, 12). At that time, the reason why coal is the favorite energy resource in any industry is that coal had many advantages which wind did not possess, such as coal is able to be transported to wherever it was needed and whenever it was desired.

In United States, wind energy was commonly used since 19th century. In 1854, Daniel Halladay, who is an American engineer invented the automatic wind water pump, which became popular rapidly in the rural areas. In 1930s, first commercial electricity producing wind turbine came to market, following the development of the electric generator. This type of wind turbine used the rotor invented by Thom-

as Perry, which is still popular in nowadays. In 1973, the first oil crises occurred. It forced the US government to put effort to utilize wind in a larger scale in energy production.

During the 20th century, wind energy received increasing attention as a potential power source, but the technology simply did not exist for large scale use (Fanchi, 2011, 152). By the middle of this century, wind energy still remained in very small scale even though scientists and engineers never fail to attempt to develop the technology. Even in 1980, the total energy from wind turbines for electricity generation was less than 1000MW, which had a small impact on the energy mix. Over the next 20 years, wind energy developed rapidly. Modern turbine technology appeared between 2000 and 2005. (Fanchi, 2011, 153)

Wind turbines have evolved a great deal over the last 25 years. They are more reliable, more cost effective, and quieter. (Manwell, 2002, 19) However, it does not mean that the evolutionary period is over. The initial cost of build a wind farm is still very high, and along with the development of the technology, it should be possible to reduce the cost of energy at sites with lower wind speeds. Today, a single wind turbine can produce up to 6MW electrical power, and researchers are seeking to increase power output up to 10MW using new technology, such as superconducting generators (Matthews, 2009). There will be continuing pressure for designers to improve the cost effectiveness of turbines for all applications (Manwell, 2002, 19).

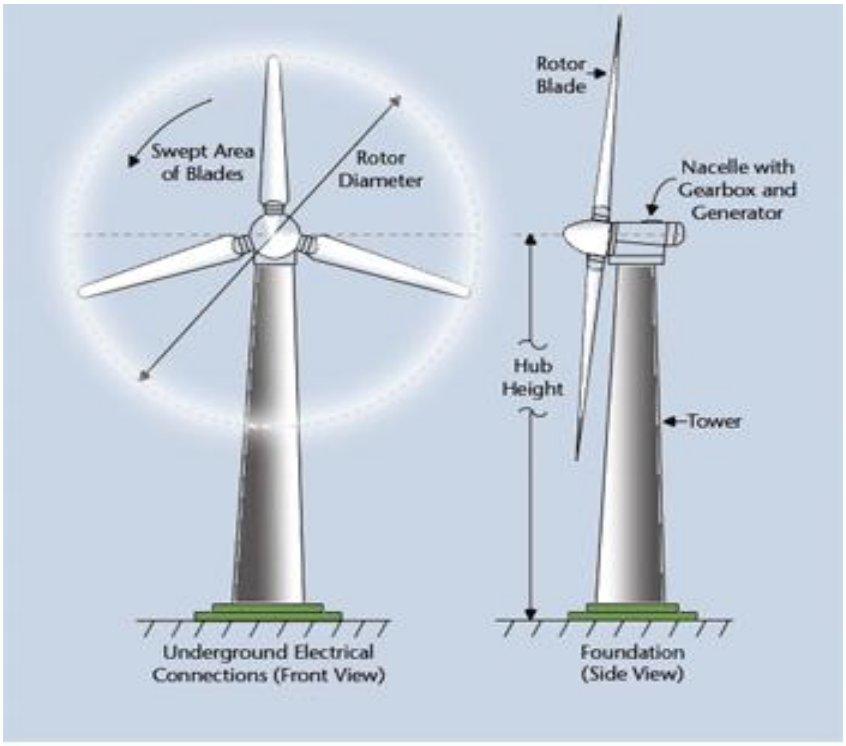

Figure 3, Modern wind turbine.

2.2.3 Wind Energy in the World

We can use two measures to describe the wind's role in the energy mix, one is the units of capacity (MW), the amount of power wind turbines are capable of producing; and the other one is the units of energy in kilowatt-hour(kWh), the amount of electricity they actually generate(Gipe, 1995,9).

Wind energy, as one of the most important alternative energy of coal and oil, has been widely explored in the world today. Wind energy is the transformation of the wind's power force into mechanical power through a turbine. The mechanical power can be used for many tasks to meet our needs, such as grinding grain or pumping water, or converting into electricity through a generator for use by homes and businesses. (Worldpress.org, 2011)

Wind energy is currently the world's fastest growing renewable power source. Joseph Florence of the Earth Policy Institute claims that "Though only about five countries in the world produce nearly three quarters of all the wind power, with the growth rate that we are seeing wind power is the fastest growing energy source in the world." (Worldpress.org, 2011)

In, 1994, wind turbines in the world can generate more than 6TWh in total. California wind plants produced 47% of that amount. Denmark and Germany each produced 17%. The other countries such as Britain, China can generate 25%. (Gipe, 1995, 9) Figure 4 shows the wind production in 1994.

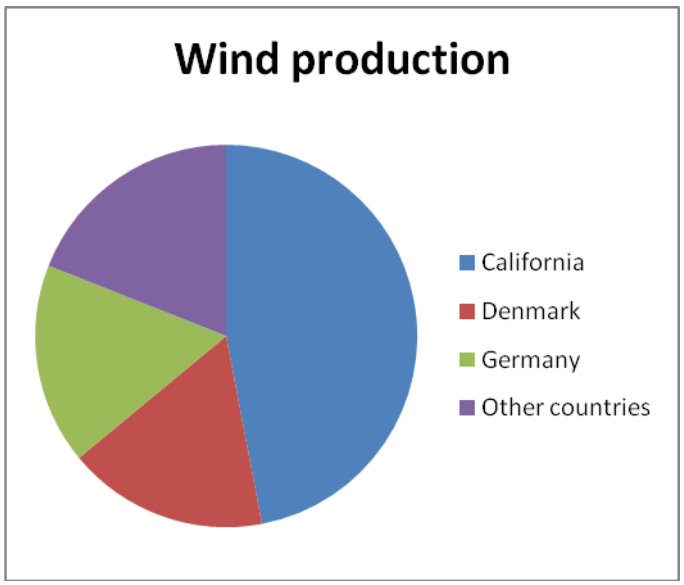

Figure 4, Wind production in 1994.

In 1998, cumulative generating capacity in the world reached 10, 000 Megawatts (MW). Manufacturers installed more than 2400MW of wind-generating capacity worldwide during that year. (Gipe, 2003)

In 2010, worldwide wind capacity reached 197 GW. All wind turbines installed by the end of 2010 worldwide can generate 430 Terawatt hours per annum, (World Wind Energy Report 2010, 2010) which is 72 times to the capacity in 1994. The wind energy production in 2010 can meet the need of the total electrici-

ty demand of the United Kingdom, the sixth largest economy of the world, and equaling 2.5% of the global electricity consumption. Wind power showed a growth rate of 23.6 % in that year which is the lowest since 2004 and the second lowest growth of the past decade due to the impact of the world economy crisis.

Figure 5 shows the growth of installed wind generating capacity from 1995 to 2009.

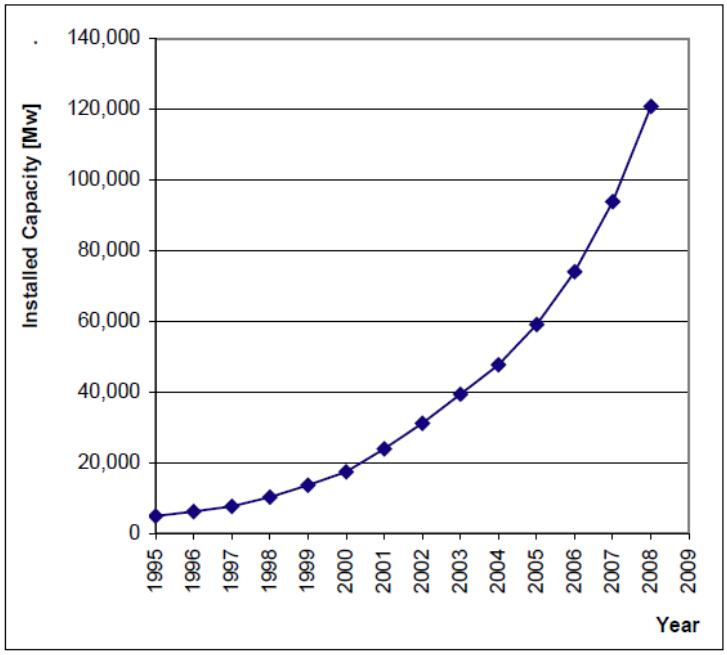

Figure 5, Growth of the world's wind energy installed capacity (Source: Global Wind Energy Council (GWEC)).

China now takes the place of United States to become the world leader in wind capacity- installing 18.9 Gigawatt, which is more than 50% of the world market. The major decrease in new installations in the whole world can be observed in North America and the United States. Germany keeps its number one position in Europe with 27,215 Megawatt, followed by Spain with 20,676 Megawatt. The highest shares of wind power can be found in three European countries: Denmark (21%), Portugal (18%) and Spain (16%). (World Wind Energy Report 2010, 2010)

From the energy experts in GWEC's point of view, "the nuclear disaster in Japan and oil spill in Gulf of Mexico will have long-term impact on the prospects of wind energy. Governments need to urgently reinforce their wind energy policies." (World Wind Energy Report 2010, 2010)

2.2.4 Wind Energy in Europe

Europe, as the origin of modern wind energy industry (In the 1890s, the Danish scientist and inventor Poul la Cour constructed the first wind turbine for generating electricity), is still the leader of wind power. Over the past decades, the feasibility and economics of wind have caused a groundswell of support for wind as an alternative to fossil fuels. Technology advances in wind turbine technology, electrical transmission technology and power grid organization have improved the efficiency and cost effectiveness of wind dramatically. (Fanchi, 2010, 163) As a consequence of these improvements, the developed nations in Europe which are lacking fossil fuel resources have regarded wind as a possible primary energy source for the future. New EU-wide statistics from the EWEA (European Wind Energy Association) show that more wind power capacity was installed last year than any other electricity-generating technology. Figure 6 illustrates the growth of wind power and decline of coal and nuclear power in 2009.

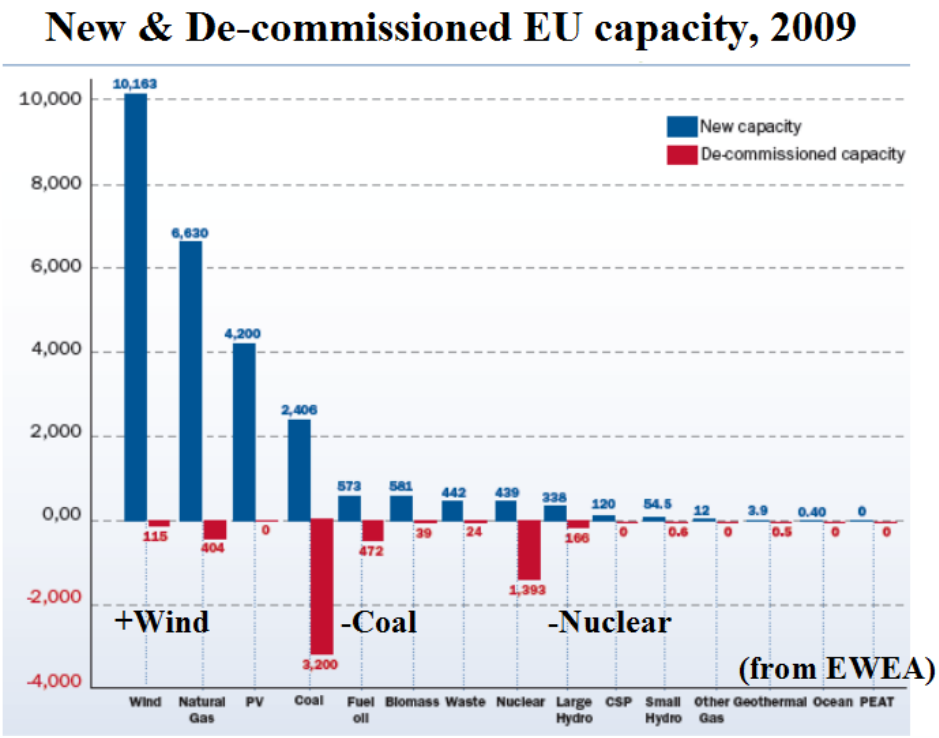

Figure 6, Comparison of energy growth and decline in 2009 (Source: European Wind Energy Association (EWEA)).

As few European countries have fossil fuel resources in their own land, and many of them fear the environmental impact due to the using of fossil fuels, these countries decided to develop wind energy which is free for the raw materials.

Since 1995, the European Union has maintained greater wind power capacity than the rest of the world combined (EWEA, 2009). In Europe, the 1995 goal of 4,000MW of wind by the year 2000 was way surpassed, and later 2010 goal was set at 75,000MW in 2003, (Nelson, 2009, 201). Now, the EU Renewable Energy Directive set a new goal in 2009 that by 2020, 20% of electricity will be generated by renewable resources including solar power, wind power, water power, etc. of which 12%-14% will be generated from wind. In 2007 there were about 14,800 wind turbines installed in 35 countries in the world among which 43% were installed in Europe.

During the year 2010, EU member state market shares for new capacity of installed wind power is 9,259 MW in total. Spain is the largest with 1,516 MW which is 16% of the total amount. Germany ranks the second with the capacity 1,493 MW (See Figure 7).

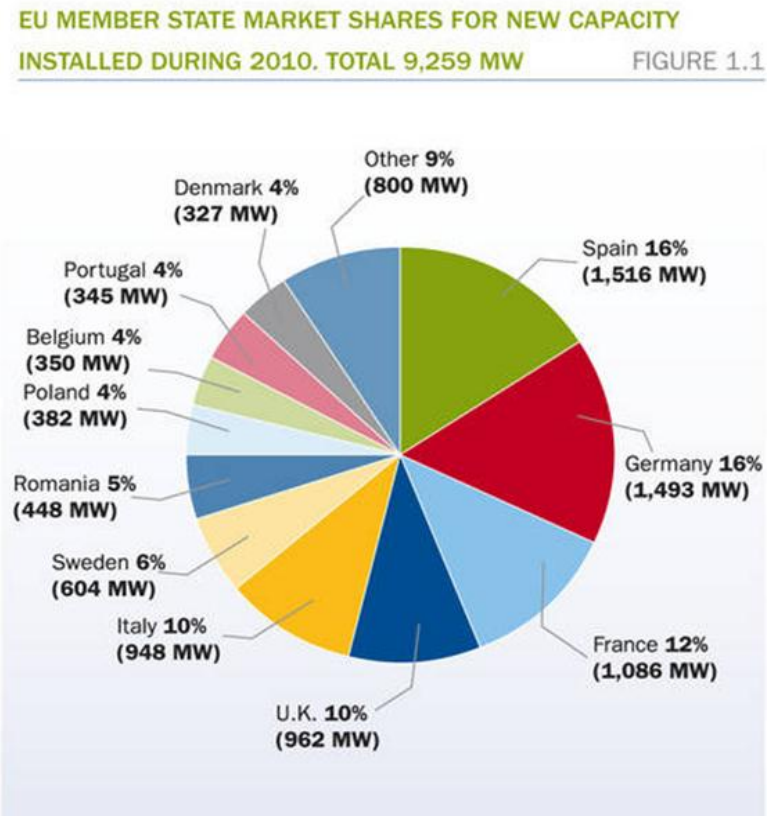

Figure 7, EU member state market shares for new capacity installed during 2010 (Source: German Wind Energy Association (BWE)).

European manufacturers have dominated the wind turbine market. The top six manufacturers have over 85% of the market, and then fifteen companies dominate the market with close the 98% share. The United States only has one major manufacturer in this industry, and China has two (Goldwind, Sinovel) and India's one (Suzlong).

Denmark was one of the first nations in the world to begin producing large amounts of wind power and to include wind as a major contributor to their national power supply. By the end of 2008, wind power had provided 20,3% of Denmark's total power supply, which is the largest percentage of any European coun-

tries. Spain (12.3%) and Portugal (11.4%) are the only other countries over ten percent (EWEA, 2009, Figure 3.10). Overall, the 27 members of the EU produce electricity from wind meet 4.1% of total electricity demand. (Fanchi, 2010, 164)

The EU Renewable Energy Directive requires its member countries to produce at least 12% of their total electricity from wind by 2020. And the relatively low cost of producing energy from wind in today's energy market makes some EU members ambitious- may enable countries to exceed this number. For example, France, which produced 3,404 MW of power from wind at the end of 2008, is expected to increase its wind capacity to at least 23,000 MW by 2020. This capacity requires it creating 1,633MW each year.

2.2.5 Economics of Wind Energy and Its Business Potential

In the previous chapters, the main emphasis has been on the installed turbines and generating capacity in the world and in Europe. In this chapter, the economic aspects and business potential of wind energy will be showed.

2.2.5.1 Economics of Wind Energy

We all know that whether a product can make profit depends on cost of this product and the market value of it. Assuming that one has designed a wind energy system that can reliably produce energy, one should be able to predict its annual energy production. With this result and the determination of the manufacturing, installation, operation and maintenance, and financing cost, the cost-effective can be addressed. (Manwell, McGowan, Rogers, 2008, 427)

The most critical factors in determining whether it is financially worthwhile to install wind turbines are the initial cost of the installation and the annual energy production (Nelson, 2009, 245). When we discuss the economics of wind, we need consider the cost and value of wind products. In figure 8, it illustrates that the economic factors of wind energy. The costs can be divided into five categories, the planning costs, including the valuation of the site, the cost of money for monitoring wind speed, examining the logistic system, and choosing the site, the installation cost, including the cost of the wind turbine, logistics, and construction (in-

cludes the construction of wind turbine and the construction of road and grid system), the transportation cost, which depends on the grid system, for example, the capacity of the grid, and whether there is existed grid system or need to build a new one, the financing costs, and the maintenance costs.

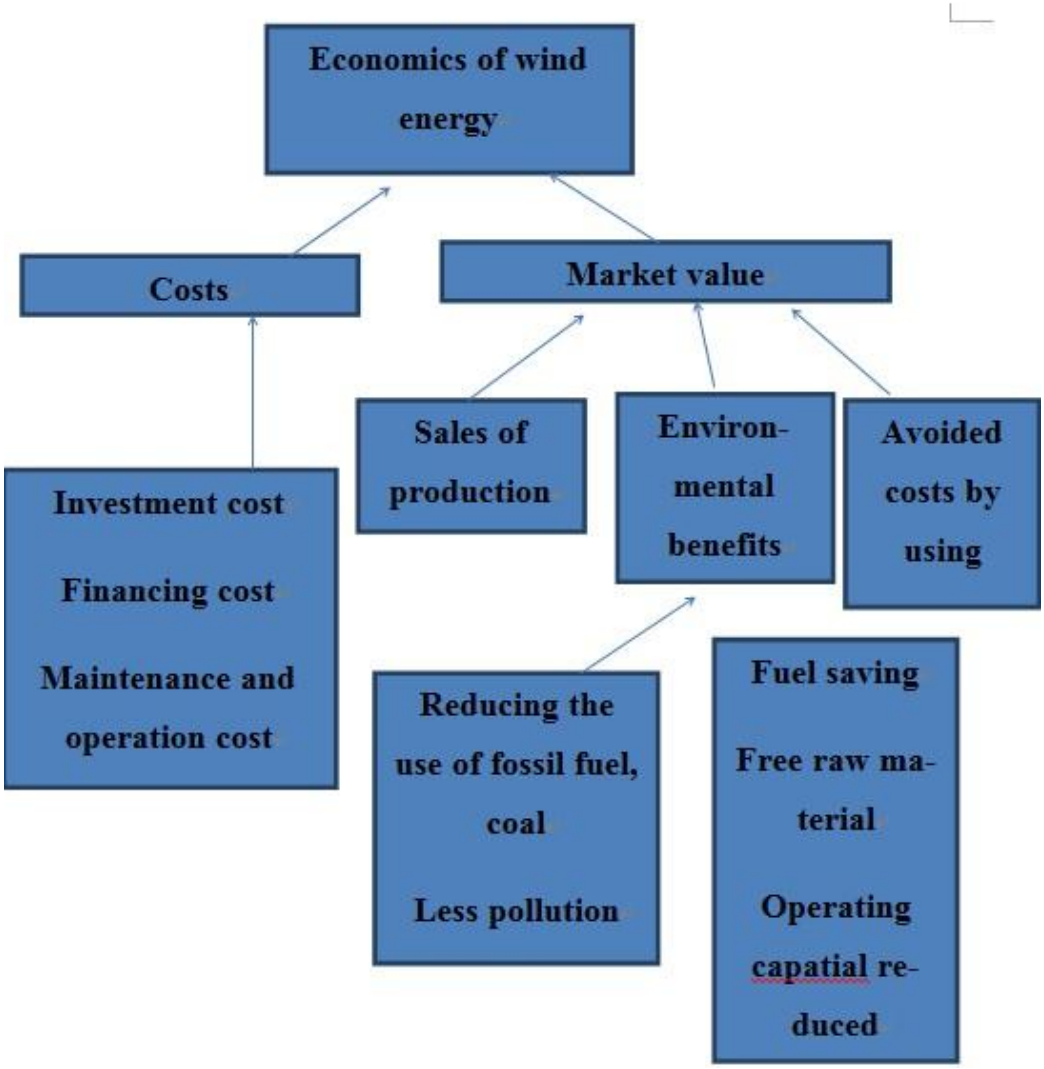

Figure 8, the economics of wind energy.

Besides the costs, we need to evaluate the value of wind products, for examples, the market price of the product, the environmental benefit, and the avoided costs by using wind energy. In determining economic feasibility, wind energy must compete with the energy available from competing technologies (Nelson, 2009, 245). That means, it depends on whether the wind energy is competitive compar-

ing with the other forms of energy. If the wind turbine produces electricity energy for the grid, the price for which the electrical energy can be sold is also critical. Today, wind farms are essentially competitive with all new power plants and all renewable energy, even combined-cycle natural gas turbines, as fuel prices have increased with oil over $100/bbl. To increase market penetration of wind systems, the return from the energy generated must exceed all costs in a reasonable time. (Nelson, 2009, 245) As wind is free, the main cost of a wind farm is the investment cost. Along with the technology development, the installed cost for a wind farm had declined to $ 1,000/kW by 2003, which equals the value of electricity produced of $ 0.04-0.06/kWh. The operation cost of the wind turbines is relatively low comparing to the other forms energy, as many wind farms are using those wind turbines can work even in the small wind (wind speed 6m/s). The operation and maintenance costs for wind farms were around $0.01/kWh.

2.2.5.2 Business potential of wind energy

Wind energy has a huge business potential in energy consuming market. In the past, the market for utility- scale wind energy systems is rapidly expanding. The world market demand has grown from about 200 MW/ year in 1990 to a value of 1300 MW/ year in 1995, and, then the capacity increased to over 4000 MW/ year in 2000. (Manwell, et al. 2008, 433)

After the oil crisis in 1973, most companies in the United States began to importing wind turbines for personal use or generate electricity for sell. Since the United States owns mature electricity system, there was market for wind turbines that were fully compatible with the utility system: 120, 240 or 480V, alternating current (AC) (Nelson, 2009, 216). Federal support for wind energy at first in 1973 was $300,000, and then, by 1980 the fund increased to $67 million. The years from 1980 to1985 were the nascent stage of wind industry. The boom of wind farms in California drove the exponential growth of the wind industry from 3 to 900 MW (Nelson, 2009, 219). The government supported and encouraged the development and wide use of wind energy by tax shelters, avoided costs and standard contracts set by the California Energy Commission. As the previous article mentioned, developing wind energy is now a main energy strategy in many coun-

tries in Europe. Europe continues to lead in installed capacity, development of multimegawatt turbines, and manufacturing (Nelson, 2009, 221).

Except for the government support, the advantages of wind energy are also an essential factor that attracts investors. The market value of wind energy can be defined in three aspects: avoided cost based value of wind energy, environmental value of wind energy, and the competitive price of wind energy. The avoided cost value of wind energy includes the fuel saving and capacity value. The inclusion of wind turbines in an electricity producing system can reduce the demand for other generating plants that require a fossil fuel or coal input (Manwell, et al. 2008, 433). People are more willing to use the "green energy" then the traditional energy which makes pollution. According to a survey by Bloomberg New Energy Finance, a market research firm, in 2011, the cost of onshore wind power has dropped to record lows, and in some regions is competitive with electricity generated by coal-fired plants. In some regions of Brazil, Mexico, Sweden, and the United States, the cost of electricity generated by wind farms is on par with coal-fired power, the report said. In those areas, the cost of wind-generated electricity is $68 per megawatt-hour compared to $67 a megawatt-hour for coal power and $56 per megawatt-hour for natural gas. (Woody, 2011)

2.3 Wind Energy Cooperatives

A wind energy cooperative is a jointly owned and democratically controlled enterprise that follows the cooperative model, investing in wind turbines or wind farms (Ramona Du Houx, 2010). Wind cooperatives are owned by their members, who share the profits. Members work together to meet their individual and collective needs. Each member has a say in how the business is run (Windshare). It often includes the farmers, investors, businesses, schools, utilities, or other public or private entities who utilize wind energy to support and reduce energy costs to members. The key feature is that members have a significant, direct financial stake in the project. (Windustry, 2010) In this part of this chapter, the different typical wind energy cooperative models will be presented.

2.3.1 Introduction to Wind Energy Cooperatives

Most of the wind cooperatives are community-based business. In a cooperative/ community-based model, the manager of a wind farm shares ownership of the project with other members. Property owners whose land was used for the wind farm are generally given a choice between a monthly cash lease and ownership units in the development. (Dean Houghton, 2008)

Financially, wind cooperatives are different from traditional wind farms. The traditional wind farm seeks commercial financing in a traditional way, such as bank loans, credit lines, personal loans and savings. The costs of these financing methods are relatively high and more risky. However, in wind cooperatives, the capital are from individual citizens, or groups of citizens, and then invest the necessary equity to purchase and install one or more turbines, and then sell the electricity to the local utility at a profit (Bolinger, 2001, 7). Both the investors and the communities can benefit from the cooperative.

The benefits of cooperative wind energy can be divided into three major parts: the economic benefits, the social benefits and the environmental benefits. The economic benefits of cooperative wind energy include the job opportunities wind energy projects provide and the increasing local property taxes. From planning to build a wind farm to its operation and maintenance, jobs are needed for: manufacturing the materials needed to build the project, transportation of supplies to the project area, construction of the project as well as building roads leading to the project, maintenance and operation(Wikipedia: Wind farm). From the social aspect, wind cooperatives help to build stronger communities, reduce the cost of electricity, and afford the local clean environment. For the environment, wind energy is a clean energy source with no pollution. There will be no greenhouse gases or carbon dioxide. In addition, since wind farms do not use any water, the ecosystem may have higher survival rate.

2.3.2 Business Models of Wind Cooperatives

In the last decade, wind cooperatives become popular. The community ownership of wind projects spread in Europe, especially in Denmark, Germany, the UK, and Sweden. There are several wind community ownership models in these countries and these community models can be divided into three categories: the community-led cooperatives, the developer-led cooperatives, and the investment funds.

Community-led models are those under which projects are initiated, developed, operated primarily by the local community. Developer-led models are those under which wind projects are initiated, developed, and operated by developers, with the community playing only a passive investment role. An investment fund includes investment funds, where a fund manager pools investment capital from the "community of interest" and then invests that capital in developer-led projects. (Bolinger, 2001, 44-46)

2.3.2.1 Wind Energy Cooperatives in Denmark

Wind partnership is the most famous Danish wind cooperative model. It refers to a contractual relationship between several parties (i.e., electricity consumers) to pool certain resources in order to run a business. In Denmark, it is the only joint form of ownership to qualify under Danish power law (Bolinger, 2001, 12). In the first place wind partnerships were developed from the bottom up by local enthusiasts who intended to use existing power and tax law to their best advantage. In the practical operating, Danish wind partnerships are quite simple. Individuals just need to pool their savings to invest in a wind turbine, and sell the power to the local utility at an attractive rate, historically equal to 85% of that utility's production and distribution costs, but fixed at 0.33 DKK/kWh under the transitional scheme detailed above (Bolinger, 2001, 12). Investors in a wind partnership need to pay their own electricity bills in the normal way – in the wind partnership, the turbine's total output is sold wholesale to the utility, instead of selling the electricity production to the individual members of the partnership. (Bolinger, 2001, 12)

As mentioned in the former text, the famous Danish wind cooperative model-partnership which is understood to be a contractual relationship between several

entities to pool certain resources in order to run a business is technically not cooperatives at all, but general partnership. It is due to the Danish electricity law. The Danish electricity law requires that wind turbines be directly owned by electricity consumers (Helby 1998a, 1998c).

Danish wind partnerships are not complicated. Individuals just need to invest their savings to a wind turbine, and sell the wind production to the local utility at an attractive rate. The Danish government put forward some policies to support wind energy and the wind partnership receives a full refund of the CO2 tax (0.10 DKK/kWh) and a partial refund of the energy tax (0.17 DKK/kWh). (Bolinger, 2001, 13) Besides of these, taxation and liability is an essential thing to be considered when forming a wind partnership. In Denmark, a partnership is not a taxable entity. Instead of this, taxes are levied proportionally on each individual partner, who is taxed according to his or her individual tax situation so that the taxation does not affect the wind partnership (Bolinger, 2001, 14). We know that in a general partnership, all partners are held jointly and severally liable for any debts incurred by the partnership, which means that personal liability extends well beyond the level of an individual's investment. However, in order to reduce the risk of liability for any debts incurred by the partnership, Danish government put forward laws to prohibit the partnership from taking on debt. This prohibition means that any financing of wind shares is done at the level of the individual, not the partnership. (Bolinger, 2001, 12-15)

This type of wind community works in this pattern: First the Danish law encourages mutual ownership of wind turbines by exempting the owners from taxes on the portion of the wind generation that offset a household's domestic electricity consumption. A wind co-op would then purchase a wind turbine, select the best site available, sell electricity to the electric utility under favorable terms, and share the revenues among its members. This enabled the group to buy the most cost-effective turbine available, even though it may have generated far more electricity than individual co-op members needed for themselves. (Greg Pahl, 2007)

The Danish government provides wind communities and individuals various supports, including the capital support, production support, and interconnection sup-

port. In 1979 the Danish government put forward a renewable energy program that included a capital investment subsidy of 30% of total project costs. During the year 1989-1999, a total of 2567 wind turbines received investment subsidies totaling DKK 275.72 million. (Andersen, 1998) Since 1993, local utilities have been required to purchase wind energy from independent generators at a rate that is 85% of their production and distribution costs. The cost of interconnection to the grid was shared by wind turbine owners and distribution utilities. This cost-sharing arrangement is important in that it more or less guarantees that wind generators will be able to interconnect to the grid, and at a limited and manageable cost that is roughly known in advance. (Bolinger, 2001, 11)

Wind development in Denmark is overwhelmingly community-based. The first modern wind turbines installed in Denmark during the 1970s were developed and owned by private individuals without government support. The government encouraged local private ownership of wind turbines through a variety of subsidies and ownership restrictions to reward the wind communities and privates (Andersen, 1998). As a result of these policies, over 175,000 households own 80% of all wind turbines in Denmark, either on an individual basis or through “cooperatives” (Wassink 2001). Here Figure 9 shows that the total wind development in Denmark (Community and Utility Ownership) since 1983 to 2000.

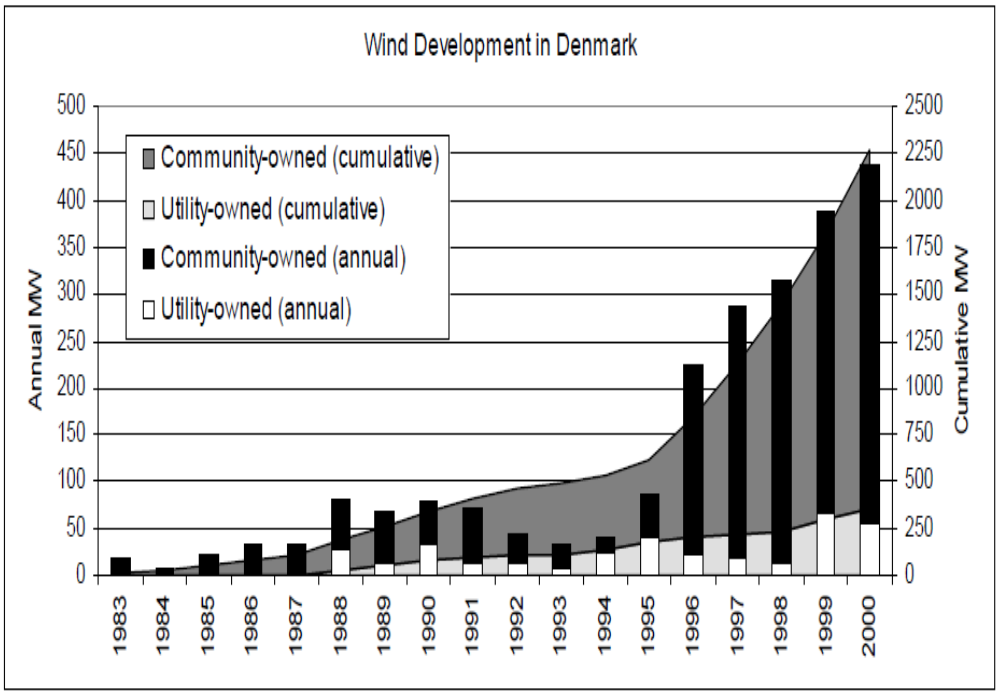

Figure 9, Total Wind Development in Denmark (Community and Utility Ownership) (Bolinger, 2001, 10).

2.3.2.2 Analysis of Wind Energy Cooperatives in USA

Cooperatives have a long tradition in the rural U.S., including farm-based energy enterprises such as ethanol cooperatives. However, the development of wind cooperatives has been hampered by their inability to take advantage of the federal production tax credit. In 2003, Minnesota passed a law allowing a new way to form cooperatives with investor members. This new structure might prove to be more beneficial for using wind energy incentives and raising capital. (Windustry, 2008, 2-5)

Along with the unique combination of federal incentives for wind development and state policies that encouraged development of community-owned wind projects, the Minnesota Flip business model was developed. It turns out that this structure is a successful model for landowners and equity investors who are interested in partnering in the development of wind projects. This model allows the

equity investor to make use of federal tax credits, while providing local owners the economic benefits of ownership. (Windustry, 2008)

In Minnesota, over 100 MW of the 895 MW of installed wind capacity are developed under the Minnesota Flip business model. The Governor Pawlenty gave the announcements of supporting an additional 800 MW of community-based energy development and the supporting pledge by Xcel Energy to develop 500 MW of wind energy; it is likely that the number of projects structured under the Minnesota Flip model will increase significantly in future years. (Windustry, 2008)

Minnesota Flip model proves to be a successful business model in that it gives permission to local owners, which contains landowners, to possess much percentage of certain wind projects. At the same time, their partners, equity investors, can adopt federal production tax credits ("PTCs"), which got from sunning a qualifying wind project. Within this model, a project limited liability company ("LLC") appears to own and operate the wind project. The tax equity investor is included in the LLC owners and local owners are included in another LLC. Under multiple occasions, local owners will be compensated by the equity investor for their expenses arisen in achieving pre-development activities, which contains permits, wind studies, interconnection and transmission studies, and finance the acquisition of wind turbines and establishment of the project. The wind project's governance and financial rights will be distributed by the LLC agreement to the equity investor and local owners. Normally, "Membership interest" is used as the term to describe every member's ownership interest in the LLC. Within the Minnesota Flip model, the financial rights and governance rights are two parts in membership interests. Each member holds some proportion of financial and governance rights, according to their capital contributions. . (Windustry, 2008)

2.3.2.3 Analysis of Wind Energy Cooperatives in Germany

The leading country in Europe, Germany, is the first wind energy nation with 27, 214 MW of installed capacity. According to the statistics in 2010, Germany complements 1.493 MW, including 108 MW offshore. However, the market in 2009 was smaller than that in 2010, which is mostly resulted from the financial crisis

and investment insecurity generated by government decisions in 2010 to lengthen the lifetime of nuclear plants in Germany. In 2010, wind energy, which generated 37.3 TWh of electricity, occupied 6.2% of national power consumption. To sum, among them, 17% of electricity was attributed to renewable sources within Germany in 2010, however, wind contributes the most. (GWEC report, 2010)

Although the wind resources in Germany are not sufficient, the introducing of Stromeinspeisungsgesetz (the electricity feed-in law (EFL)), in 1991, in the phrase of developing wind energy assists the success of Germany. In order to ensure a stable and profitable market for wind projects, the EFL has lifted Germany to core position of installed capacity, and preceded the development of a strong wind turbine manufacturing foundation. (Bolinger, 2001, 28) The outstanding proposition of the EFL is community wind energy: more than 100.000 Germany individual or joint-owned wind turbine (Ecotec 1999). In April 2000, the authority exchanges the EFL with the Erneuerbare-Energien-Gesetz or EEG (also known as the "Act on Granting Priority to Renewable Energy Sources" or the "Renewable Energy Sources Act"). The EEG is originally an upgraded level of the EFL, aiming at adding Germany's system of feed-in tariffs into compliance with EU law, make the cost inequity issue in a more proper manner then did the5% cap. And make sure the stable investment environment for renewables Europe liberalizes its electricity markets. (Bolinger, 2001, 30)

GmbH & Co. KG is the most popular form of community wind ownership in Germany. In this model, a wind developer commonly incorporates his business as a limited liability company. When the developer undertake a project, will form a limited partnership with his limited liability company as general partner and individual investors as limited partners. About the members, the local investors are the developer's main targets, but usually do not restrict share ownership to a particular area. Project revenues are distributed proportionate according to the level of each partner's investment. There are several advantages of this model. For example, as we know, the cost of establishing a new limited liability company (GmbH) is relatively high, while it is easy and inexpensive to form a partnership (KG). (Bolinger, 2001, 31) So, this model enables developers to spread the high

costs of GmbH formation over multiple projects and partnerships. Furthermore, in this model, the developers can liquidate their part-ownership in one project in order to finance another (Ecotec 1999) by offering shares to the public, and also potentially reduces planning objections.

Conventional wind cooperatives are seldom forming in Germany, because of high beginning capital and existence of a more attractive tax-advantaged alternative- the GmbH & Co. KG (Langniss 1999). Fundamentally in this structure, it is a limited liability corporation that assumes the position of the general partner in the limited partnership. Among the limited partnership, one normal partner must have unlimited liability and assumes the business management. Another partner, known as the limited partner, has to be limited to a specified amount of his contribution towards the business assets and is not usually involved in the business management. (Tieben Helmer, 2011) This kind of model is priceless to the developer in several ways. First and foremost, the beginning capital cost of a limited liability company is pretty high, while to form a partnership is comparatively easy and inexpensive. Then, this model helps developers to allocate the high costs of limited liability company formation into various projects and partnerships. Secondly, this model can offer shares to the public, which allows developers to liquidate their part-ownership in one project so as to finance another, and also potentially lower planning objections. (Bolinger, 2001, 31)

A GmbH & Co, KG considered a private partnership pays no corporate tax- each partner is measured at the individual level, Furthermore; partners in a private partnership have been able to deal with losses from the depreciation of a wind share against all other forms of taxable income, allowing investment in a wind fund more popular tax haven for rich Germans. Limited partners are trustful for the total amount of investment. Although the general partner has unlimited liability personal liability is limited because the general partner is most often the developer's limited liability company (GmbH). (Bolinger, 2001, 32)

2.3.2.4 Analysis of Wind Energy Cooperatives in Sweden

Sweden is known as an outstanding market of wind power development because of good wind resources and large size of the territory, and its relatively small population. As statistics shown in the Sweden Wind Energy Association, the Swedish wind energy potential is accounted for around 540 TWh/year. (GWEC report, 2010)

Real estate commune which in Sweden is Vindsamfällighet, is perhaps the most unusual wind ownership structure by western standard. This kind of community is a common form of community wind ownership in rural Sweden. Real estate commune is based on the traditions of common law and communal ownership of physical resources, such as fishing or grazing rights, which were often attached to land titles, which means the owners of the wind farm, must own a land which the wind farm is established on. In the operation aspect, communal ownership of a wind turbine is relatively simple. Real-estate owners join together, establish a real estate commune, and invest their funds to establish one or more wind turbines. About the electricity products, the commune sells the turbine's whole output to the grid which is like how the wind partnerships operate in Denmark, receiving the mandated "fair" price from the local utility, as well as the environmental bonus. A small portion of revenue is retained by the commune's management association for operation and maintenance costs, and the rest is passed along to investors on a pro rata basis. (Bolinger, 2001, 20) Most of the wind farms choose real estate commune as their ownership structure is because of its simplicity. To establish a commune does not require much legal documents. A commune can be established just by having each participating real estate owner fill out a standard legal form and submit it to the local real estate registrar and the legal counsel is seldom required(Bolinger, 2001, 20).

Since 1989, the introducing of the first Vindsamfällighet (real estate commune) by the founder of Vindkompaniet AB on the island of Gotland, where resides a large amount of Swedish installed wind capacity, community wind ownership schemes have existed. Two models, named as Vindsamfälligheter (real estate communes) and Vindkonsumföreningar (consumer cooperatives), are made up community

ownership schemes. During the 1990s, real estate connunes and consumer cooperatives have run basically on a local level, selling their power to the local utility at the agreed upon feed-in tariff. (Bolinger, 2001, 20)

Vindkonsumföreningar is another popular form of participatory wind ownership in Sweden. This kind of cooperative form is partly like the consumer cooperative in United States. While Swedish wind cooperatives have traditionally sold their power to utilities, at least one cooperative has recently begun to sell wind power directly to its members nationwide at cost (Bolinger, 2001, 22). For most cooperatives, one of the basic principles is that any profit earned by the cooperative over the course of the year is distributed to each cooperative member in proportion to the volume of business that member has conducted with the cooperative. Thus, dividends are distributed based on the level of patronage, rather than on the level of investment. In this way, each cooperative member earns the same return on investment. (Bolinger, 2001, 23)

Figure 10 presents annual and cumulative installed wind capacity in Sweden, by type of ownership back to 1990. At the end of 2000, Sweden owned about 240 MW of installed wind capacity, 25MW of which was proved to be owned by community.

In the year of 2003, Sweden started a tradable green certificate support system, giving producers of renewable electricity (wind, small hydro, biomass based CHP) support for every MWh they manufacture. (GWEC report, 2010) The Swedish system is a market based program which proceeds the development of wind community.

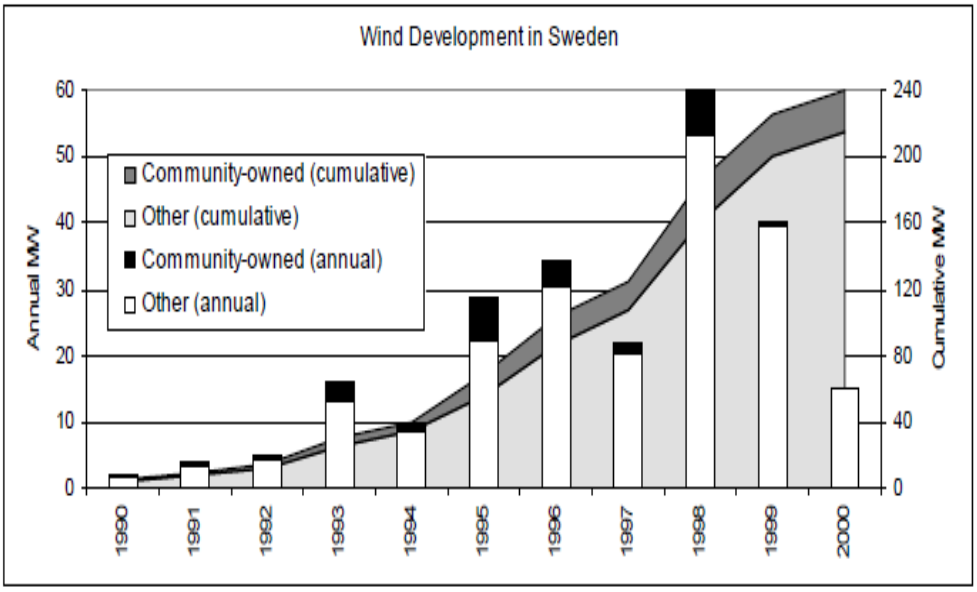

Figure 10, Wind Development in Sweden (Community and Other Ownership) (Bolinger, 2001, 17).

2.3.2.5 Analysis of Wind Energy Cooperatives in Great Britain

From the wind experts' point of view, UK is one of the best places in Europe for wind energy development because of its abundant source of wind and after the a slow start, the development of recent few years in Great Britain proves that it owns a huge wind power potential.

The wind energy develops rapidly in UK these years. From January to December 2010, there are about 40 new wind farms were found in this country, with the totaling 962 MW of additional capacity and taking the country's total installed wind power capacity to 5,204 MW (GWEC report, 2010).

Most of wind farms in Great Britain are located in Scotland (2,374 MW), in the North West (1,009 MW) and in Wales (530 MW). Scotland alone installed a third of all new wind power capacity in 2010 (376 MW) (GWEC report, 2010).

The UK also dominates the world's offshore wind market with the 1,341 MW of installed capacity offshore. A further 1,154 MW of offshore capacity are under

construction, the majority of which may come online as early as 2011(GWEC report, 2010).

There are two popular cooperative business models in Great Britain: Industrial and provident society and the Public Limited Company. An industrial and provident society is a legal structure appropriate for organizations pursuing both economic as well as social goals, and may be registered either as a bona-fide cooperative society or as a society for the benefit of the community (Bolinger, 2001, 36). As the nature of industrial and provident society is a bona-fide cooperative, it is appropriate for a community-owned wind scheme. There must be at least seven members in an industrial and provident society (IPS). An IPS can issue a maximum of £20,000 worth of shares to each member. According to standard cooperative principles, such as open membership, one member one vote, and distribution of profits, an IPS will generally be organized. (Bolinger, 2001, 36) From the legal side, the industrial and provident society is not technically a cooperative, which brings it some considerable room for flexibility in operations. For example, it is possible to restrict membership to (or favor members from) certain geographic areas, and to require the purchase of a minimum number of shares (Bolinger, 2001, 36). Another advantage of ISP is the unrestricted ability to advertise shares to the public. It is different from the other forms of wind communities, which for example, the community-owned wind projects – the public limited company – can also offer shares to the general public, but must raise the target amount stated in its prospectus within 40 days, which is a tight deadline for mobilizing diverse community revenue (Bolinger, 2001, 36).

As another popular business model in Great Britain, the Limited Public Company, in 2008, there are only three wind communities using this model in Great Britain, which is the Wind Fund plc. because of its complexity and relatively high expenses. But this kind of business model has its own advantage either: there is no limit on the amount each member can invest, and the fund is able to offer shares to the public (Bolinger, 2001, 40). British law requires that public limited companies to raise a minimum total share capital of £50,000, but considering the capital-intensive nature of wind industry, this amount to are low enough to not be ignored.

To raise capital, a plc must offer shares via a prospectus, and must raise the minimum amount of capital listed in the prospectus within forty days. Because of this time constraint, a plc is more likely to seek investors on a national rather than local basis, and this is the approach taken by The Wind Fund plc. (Bolinger, 2001, 40)

In UK, the government is not likely to provide too much support for its national wind energy development. Not as same as Denmark, Sweden, Germany, and Spain, which, all, have afford multiple supports mechanisms for wind power all over the 1990s (including attractive feed-in tariffs and tax incentives), the U.K. has, however, instead depended almost wholly on a competitive tenderinf process famous as the Non-Fossil Fuel Obligation (NFFO) to proceed renewable energy (Bolinger, 2001, 33). In addition, the NFFO support mechanism offers only production subsidies, but not capital investment subsidies (Bolinger, 2001, 33).

UK is slow in developing the community wind ownership for various reasons. First, it is said that the cost of UFFO system is high and therefore not well-suited for small wind projects. Secondly, the negative sentiment started by planning and permitting wars over large wind projects, has departed into smaller projects as well in some occasions. Thirdly, the UK does not provide any tax incentive or capital subsidies for wind projects as may other neighbor, the NFFO is the single source of support, and the amount of projects able to receive NFFO support is by nature limited. However, community-owned wind projects have attracted attention from local developers, citizens, and even the British government. Additionally, there are two successful participatory wind ownership projects to date. (Bolinger, 2001, 33)

There is not a specific cooperative law, which allows structures almost any legal form of business along cooperative principles (R. Mitchell 1994). Although there are legal potential legal structures suitable for participatory wind ownership in the UK, this case study will concentrate on the two employed: the industrial and provident society (IPS) and the public limited company (plc). (Bolinger, 2001, 35)

3 EMPIRICAL PART

In this chapter, readers will find the analysis both in words and graphs on the questionnaire answers from the respondents. The research results is concerning how a community/cooperative owned wind energy business model has been applied in Sweden, United States, Denmark, Great Britain and Germany.

3.1 Research Methodology

The research method of my thesis is a survey with an in-depth analysis. The primary data gets from the survey. In order to collect these data, quantitative research is the main method that I will use in this research. Quantitative method is an approach of scientific method which used in research of business and management. This research method offers the researchers a more objective base to guide professional practice.

In this research, the survey is carried out by questionnaires. The questionnaires via e-mail will be the main method to achieve the goal of this study. The questionnaire is sending out as a website link which was created by using E-lomake. E-lomake is software used to make web-based questionnaires and surveys available within only the specific network of Vaasa University of Applied Sciences (VAMK 2011).

All of the e-mails are sent to the companies, communities, cooperatives doing business in wind energy. In this survey, totally 312 questionnaires (web link via e-mail or chatting tools) have been sent to respondents. Among those, 6 were returned by respondents.

3.2 Analysis of the survey

The first question in the survey concerns about the location of the cooperative/community and the operation business model.

It is essential to know the location of these wind cooperatives as the legal system, taxation system, and the government support method varies from country to country which influence the choice of business model of wind cooperatives.

Among the 6 respondents, 3 of them operate their operatives in Denmark. These three cooperatives all run their business under the Co-operative partnership model, which is the most popular wind cooperative model in Denmark. Under this model, the members or investors just need to invest their savings to a wind turbine, and sell the wind production to the local utility at an attractive rate.

One of the respondents is from Canada, running his business under the co-operative business model which is owned and democratically controlled by its members.

One respondent from Great Britain who replied to this survey introduced a brand new cooperative model, the Fintry Development Trust. They own a fifteenth of a wind farm in their area and take income from that for their community.

The last respondent is from Germany, running a business under the classical GmbH&Co.KG (Public Limited Company+partnership).

Figure 11 and Figure 12 show the result of the first question in the survey.

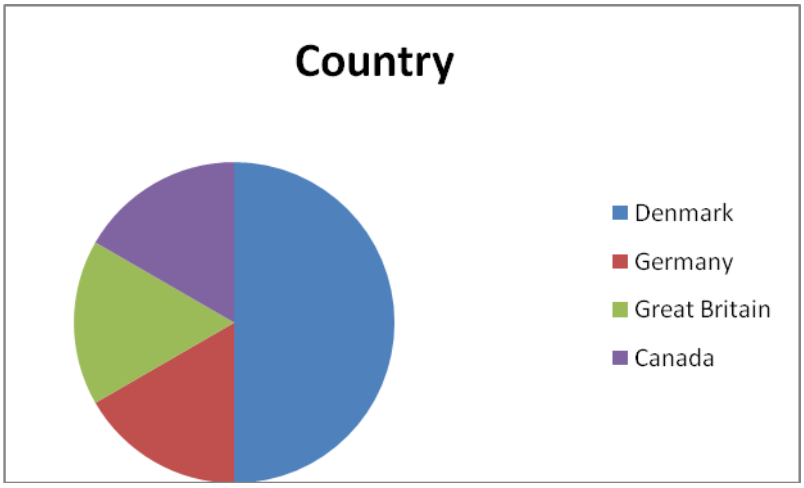

Figure 11, the location of the respondents.

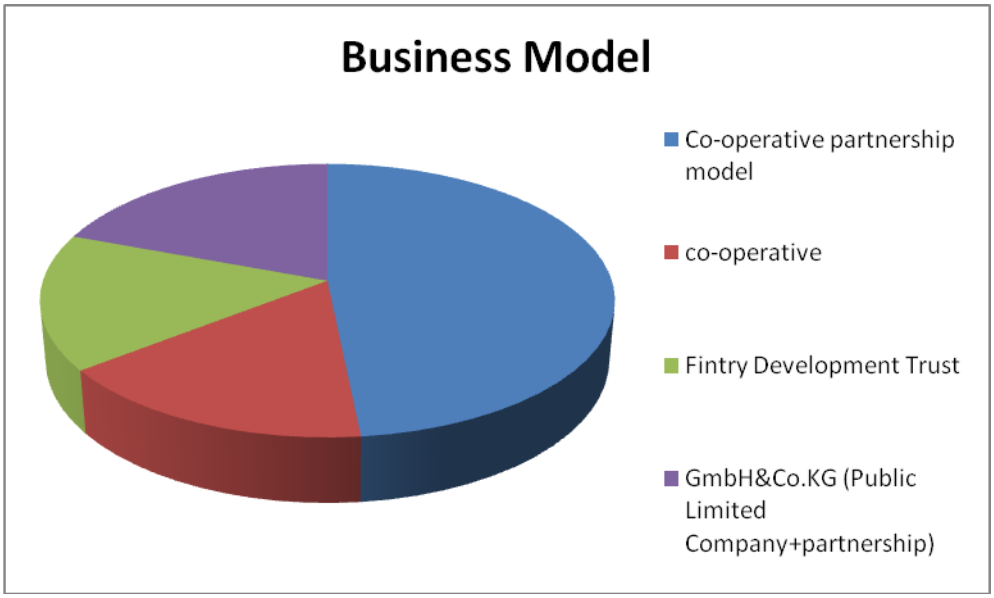

Figure 12, the business models in this survey.

Question 2 asks the respondents that the owner structure of their co-operative wind power organizations.

This question aims to figure out the composition of co-operatives under different business models. The Canadian wind cooperative states that the private persons own the share of 99% and company owns only 1%. Under this structure the members have the full right to control the business by voting for decisions.

One of the Danish cooperatives points out that the private persons own the share of 90% and other legal institutions own the share of 10%. In another Danish co-operative, the private persons own the share of 95% and other institution own 5%. In the last Danish cooperative, the private persons own the share of 92% and other institution own 8%. Unlike the Danish cooperatives, the private persons in the German cooperative own the whole 100% of the share. The British cooperative did not answer this question in the survey. No cooperatives in this survey have the Municipalities and other tax financed institutions owned their shares.

Figure 13 shows the result of question 2.

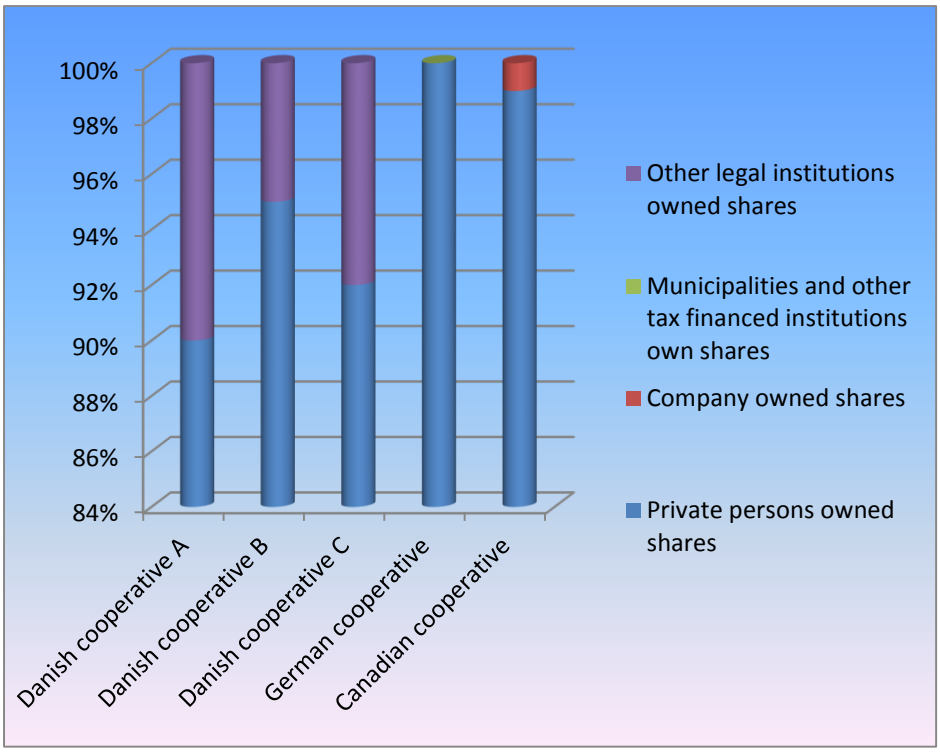

Figure 13, the owner structure of their co-operative wind power organizations.

According to the result, from my point of view, the reason why all the Danish co-operatives have other legal institutions owned their shares and the private persons in Canadian and German cooperatives nearly own the whole shares is due to the different legislation and taxation. The Danish electricity law requires that wind turbines must be directly owned by electricity consumers.

Question 3 is about the amount of wind turbines owned by the cooperatives. The amount of wind turbines in a wind farm result in the wind electricity capacity directly.

The Canadian wind cooperative does not own their own installed wind turbine now, but by the year 2013 they will have one. The Danish wind cooperative A owns 4 wind turbines in their wind farm, the Danish wind cooperative B owns 10, and Danish wind cooperative C owns only 1 turbine. The German wind cooperative owns 3 turbines. The British wind cooperative answers that they owns 1 of the 15 wind turbines in the wind farm.

Figure 14 shows the result of question 3.

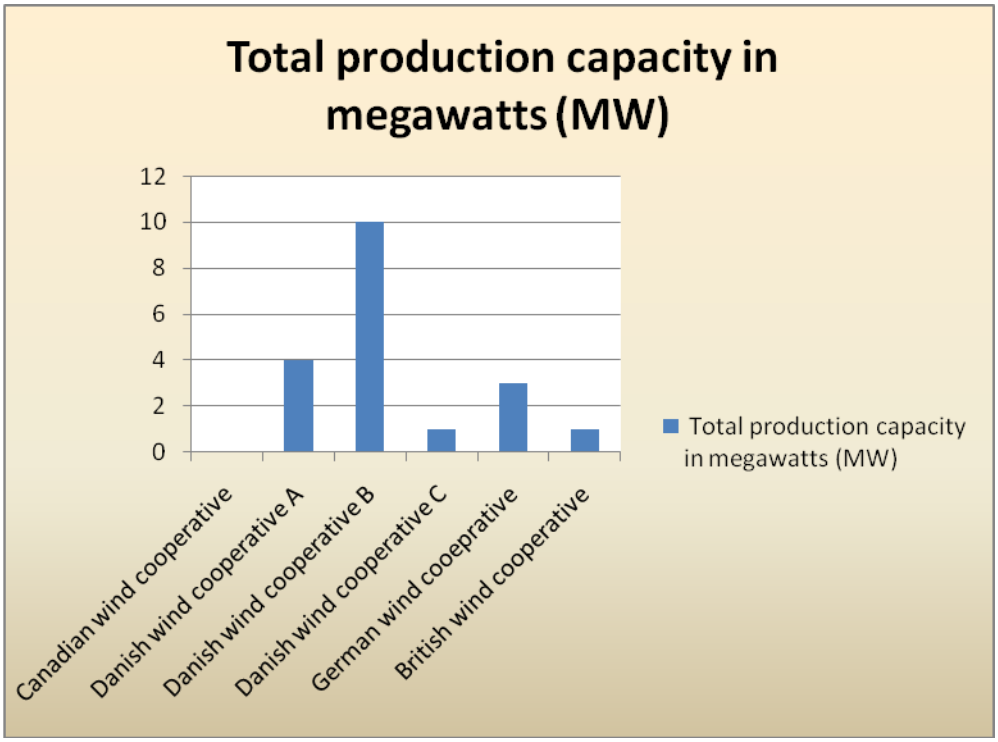

Figure 14, the amount of turbines owned by each wind cooperative.

The forth question is about the total production capacity in megawatts (MW) of the respondents' business.

From this question we can know the business scale of these respondents. There are two parts in this question. The first one is the existing production capacity and the second one is the capacity in plan.

The total production capacity of the Canadian wind cooperative is 0 for now, but they plan to get 2 MW by the year 2013. For the Danish wind cooperative A, they now have the capacity of 2.4 MW and they do not plan to install more wind turbines in recent years so the capacity in plan is 0. The Danish wind cooperative B has larger production capacity of 20 MW due to they have more wind turbines but purchase more wind turbines to increase their capacity is not an option for them in recent years either. For the Danish wind cooperative C, now they have the production capacity of 3.6 MW in total and they have no interest in increasing this amount. The German wind cooperative which owns 3 wind turbines has the total production capacity of 2 MW and has no plans to increase this number. The British wind cooperative mentioned in the survey that the production capacity of their 15th wind turbine is 2.5MW.

Figure 15 illustrates the result of question 4.

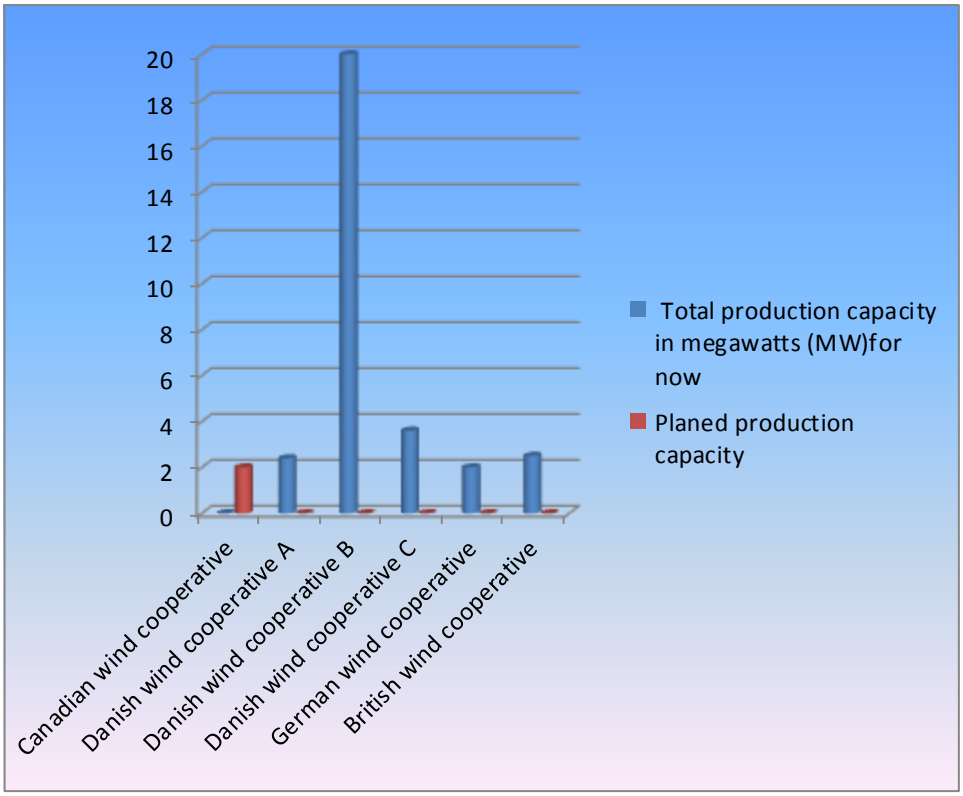

Figure 15, the total production capacity in megawatts (MW) of the respondents' business.

The fifth question is the annual electricity production in megawatt hours (MWh).

When ask about this question, the British wind cooperative and Canadian wind cooperative consider it is confidential and refuse to answer. The Danish wind cooperative A states that in last year the number is 4,200 but it is abnormal. The standard annual electricity production in megawatt hours should be 4,600 MWh. The Danish wind cooperative B provides me the answer that the production in megawatt hours is 42,500 MWh yearly. The answer from Danish wind cooperative C is 10,700 MWh. The annual electricity production in megawatt hours (MWh) of German wind cooperative is 10,000 MWh.

The result of question 5 is showed in Figure 16 below.

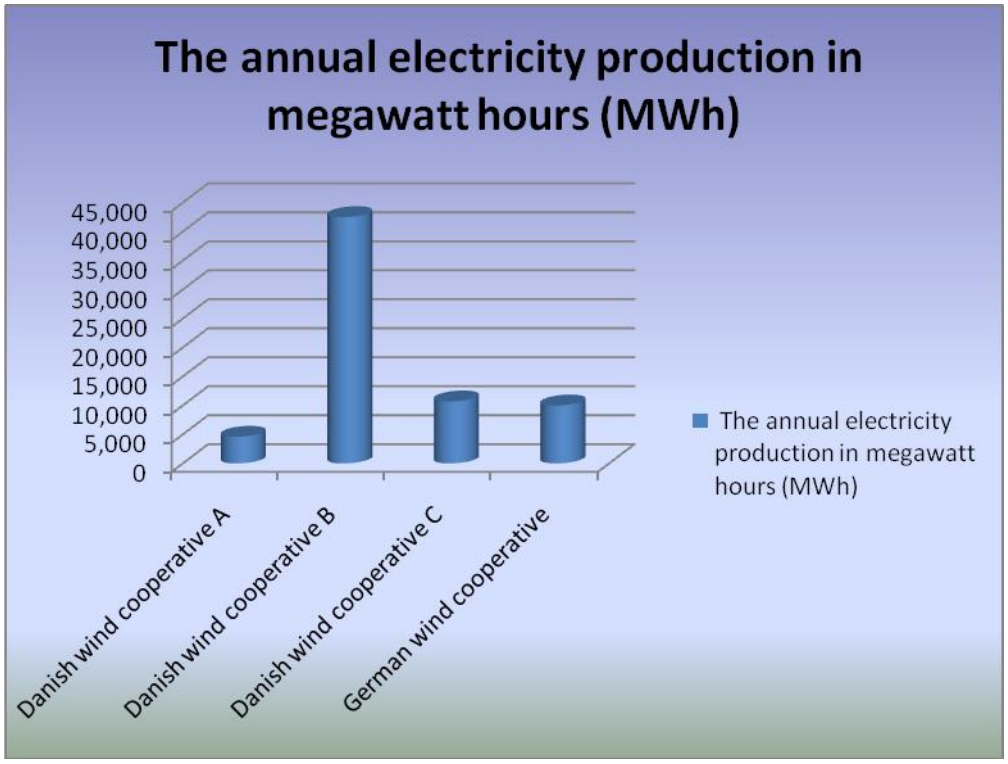

Figure 16, the annual electricity production in megawatt hours (MWh).

Question 6 asks the average wind speed at the respondents' operation site(s).

The wind speed in the site of the Canadian cooperative, the Danish wind cooperative A, and the Danish wind cooperative B is 7-7.5m/s. In the site of the Danish cooperative C, the wind speed is 7.5-8m/s. The wind speed at the site of the German wind cooperative is 6.5-7 m/s at the site of the British wind cooperative have the highest wind speed above 8.5 m/s.

From question 3, 4, and 6, we can draw a conclusion about the facts (turbine amount, wind speed) that affects the total production capacity. The result is showed in Figure 17.

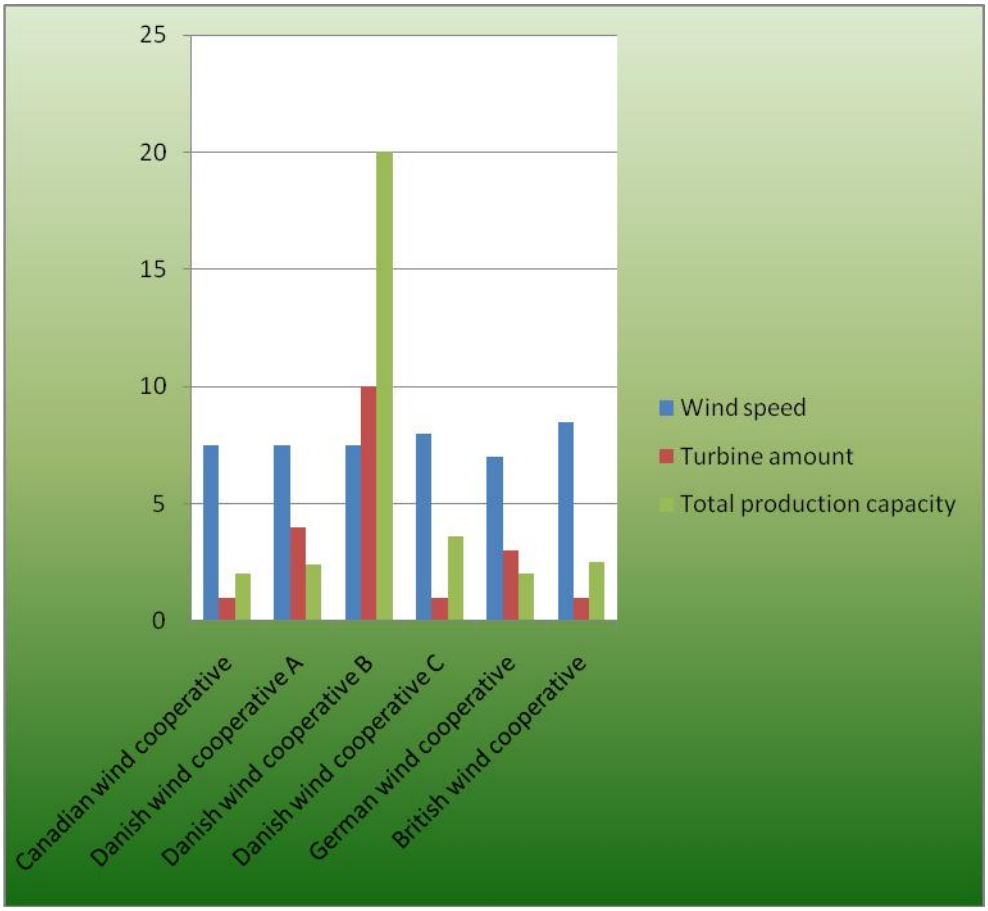

Figure 17, the facts that affect the total production capacity.

Question 7 aims to find out how do the wind cooperatives deal with their produced electricity. There are three options I offer to this question:

- Sell all the produced electricity
- Use for their own needs
- Sell part of the produced electricity and use some part of it

According to the answers offered by the respondents, it turns out that all of my six respondents sell all the produced electricity to local entities instead of using them for their own.

Question 8 is the average selling price for electricity per MWh of the wind production.

The average selling price for electricity per MWh of the Canadian wind cooperative is 14.5 cent CAD/KWh, which equals to 101.3 EUR/MWh. The three Danish

wind cooperatives sell their wind production at the average price of 370DKK/ MWh, which equals to 49.617 EUR/ MWh. The German wind cooperative sells its wind production at the price 400 EUR/ MWh. The British wind cooperative considers it is confidential and refuses to answer the question.

Figure 18 illustrates the result of this question.

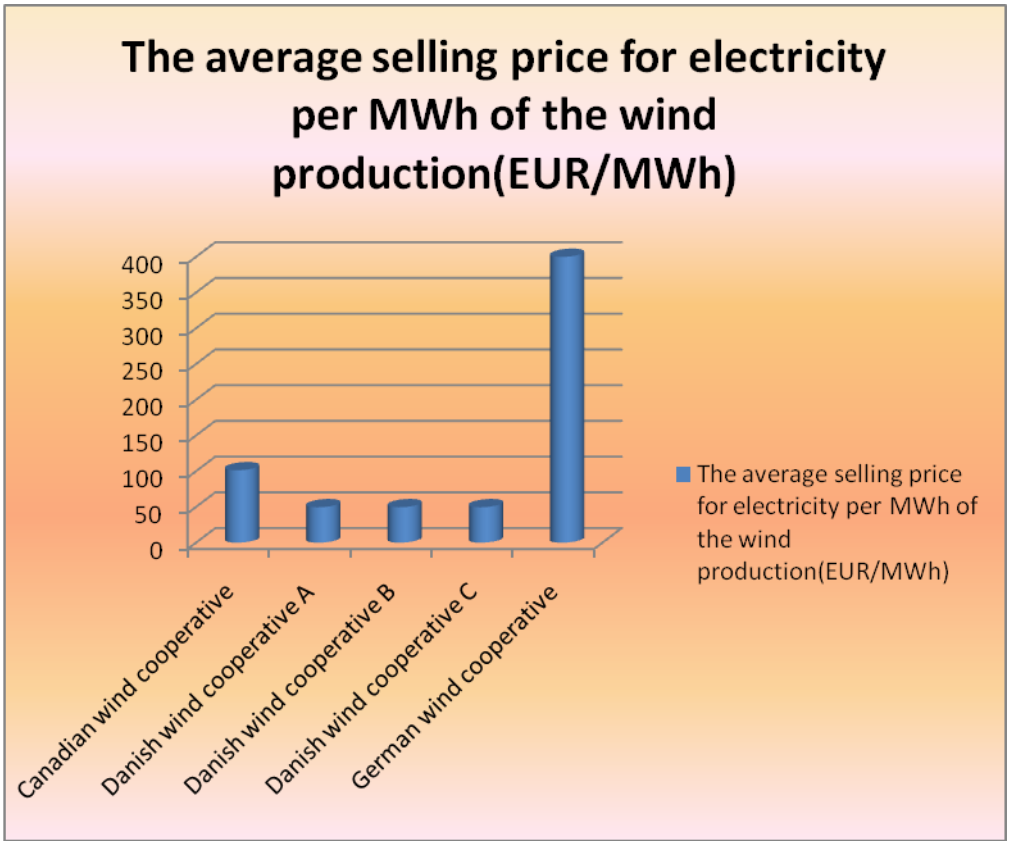

Figure 18, the average selling price for electricity per MWh of the wind production (EUR/MWh).

Question 9 asks the average investment cost per MW for wind turbines.

The Canadian and British wind cooperation refuse to answer the question because they think it is confidential. The average investment cost per MW for wind turbines for the Danish wind cooperative A is 6.83 million DKK, which equals to 922,600 EUR. The Danish wind cooperative B answers that the cost for the turbine is 12.2 million EUR and 0.12 million EUR for the 3.5km cable to shore. We

have known the total production capacity of Danish wind cooperative B is 20MW so we can calculate the average invest cost per MW is 1,220,000 EUR. The average investment cost per MW of Danish wind cooperative C is 14.4 million DKK, which equals to 1,931,000 EUR. And for the German wind cooperative, the average cost is 2,000,000 EUR.

The result of question 9 is illustrated by Figure 19.

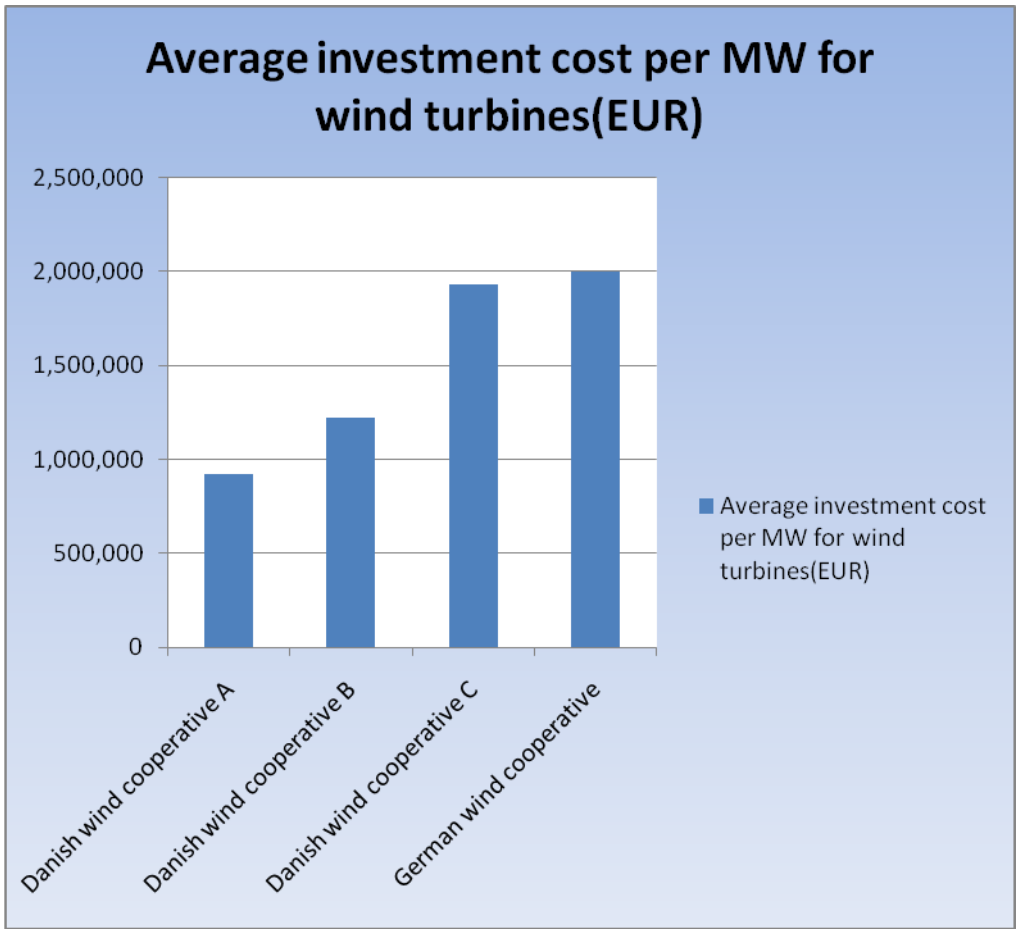

Figure 19, the average investment cost per MW for wind turbines.

Question 10 aims to understand the annual average operation and maintenance (O&M) costs per MWh of wind cooperatives.

The Canadian and British cooperatives refuse to answer this question. The Danish cooperative A spends 110 DKK (14.75 EUR) on the annual average operation and

maintenance (O&M) costs per MWh. The Danish wind cooperative B spends 150 DKK (20.16 EUR) on it. For the Danish wind cooperative C, 96 DKK (12.87 EUR) is enough to cover the annual average operation and maintenance (O&M) costs per MWh. The German wind cooperative spends 10 EUR for the operation and maintenance costs per MWh yearly.

Figure 20 shows the result of question 10.

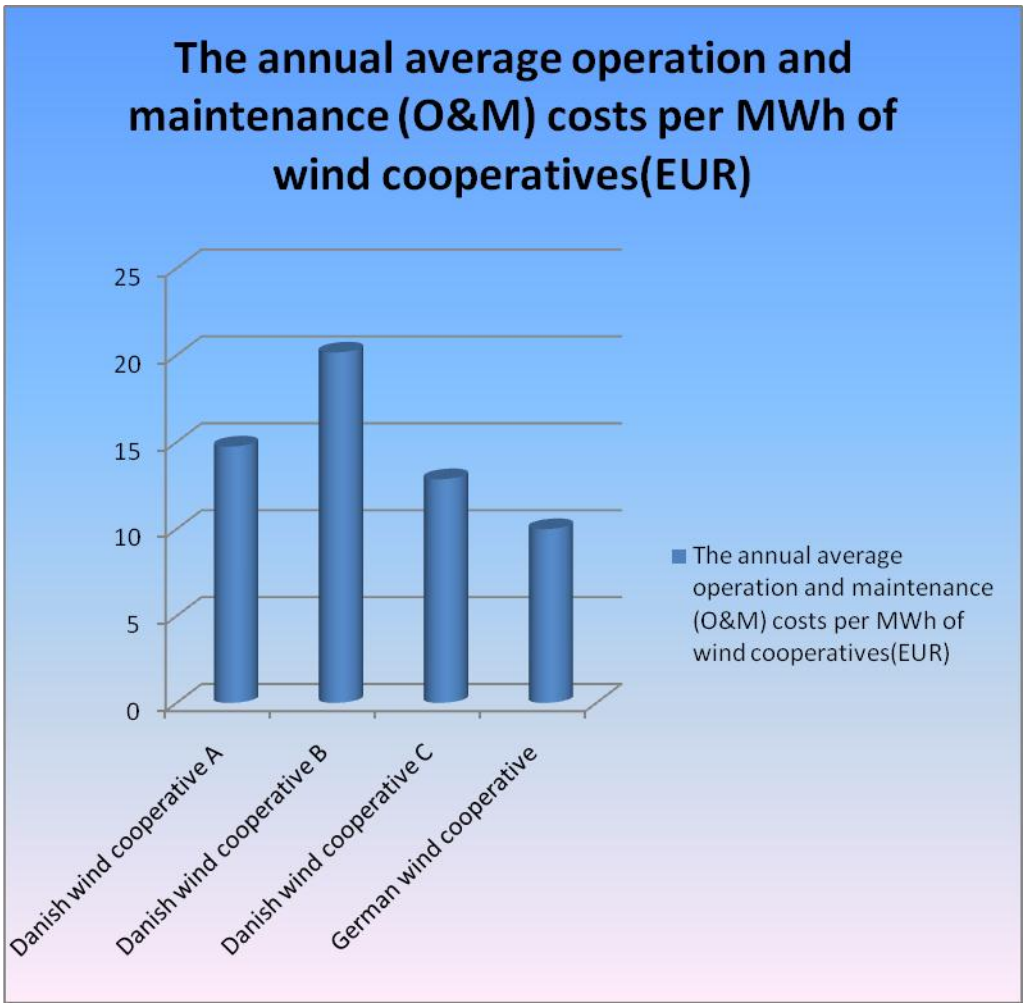

Figure 20, the annual average operation and maintenance (O&M) costs per MWh of wind cooperatives.

The question 11 is about how the wind cooperatives have financed the investment.

To this question, the Canadian and the British wind cooperative refuse to answer. All of the three Danish cooperatives claim that 100% of their investment is collected by the investors/members. On the other hand, the German cooperative has its investment from three different sources. They get 10% of the investment from their members/investors, 50% from the bank loan, and 40% from the subsidies from the government.

The result of question 11 is showed in Figure 21 below.

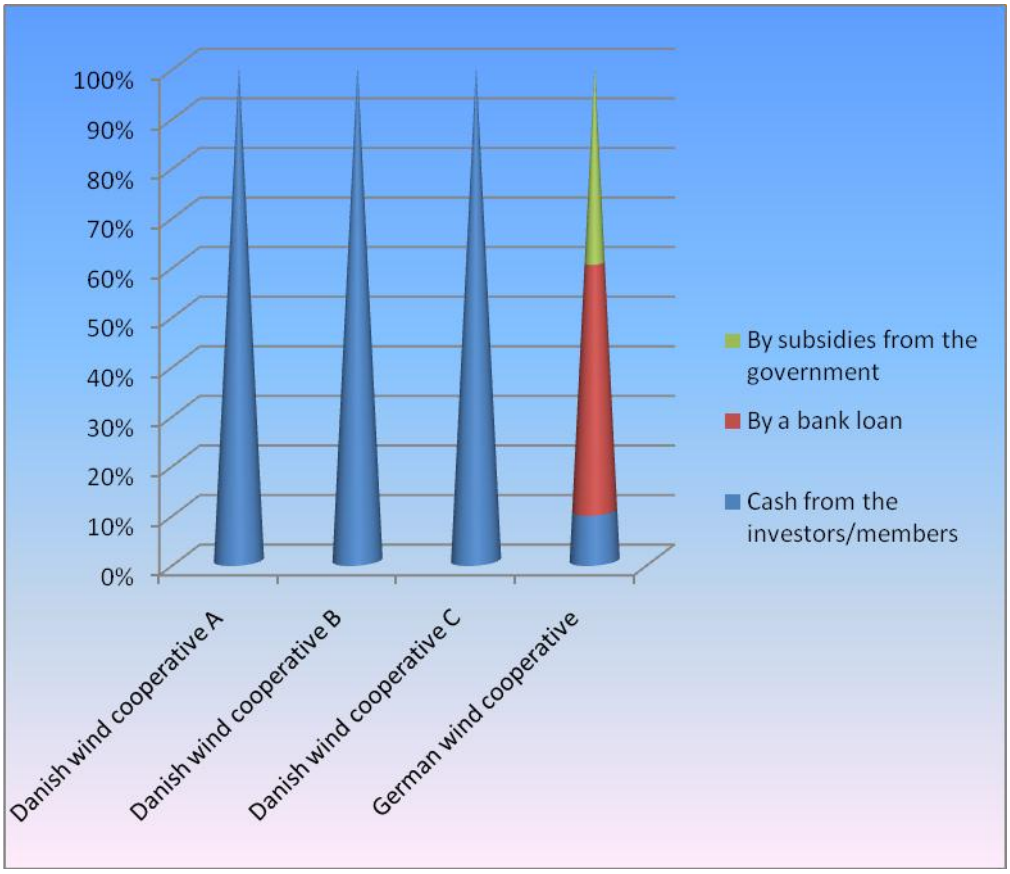

Figure 21, the way the wind cooperatives financed their investment.

From my point of view, the different source of investment money among these wind cooperatives is due to the nature of the business model of these wind cooperatives. All of the three Danish wind cooperatives are running business under the wind partnership. It is a very simple business model, and it only requires its members to invest some money in a wind turbine and sell the power to the local utility.

In this situation, all of the members need to contribute a certain amount of money. It is why they do not need find different investment from other resources.

Question 12 is about whether there are any limitations for becoming a member or investor to the cooperative or community owned wind power business.

Among the 6 respondents, 4 of them claim that they do not set any limitations for the members or investors, and 2 of them set a limitation.

Figure 22 illustrates the result of question 12.

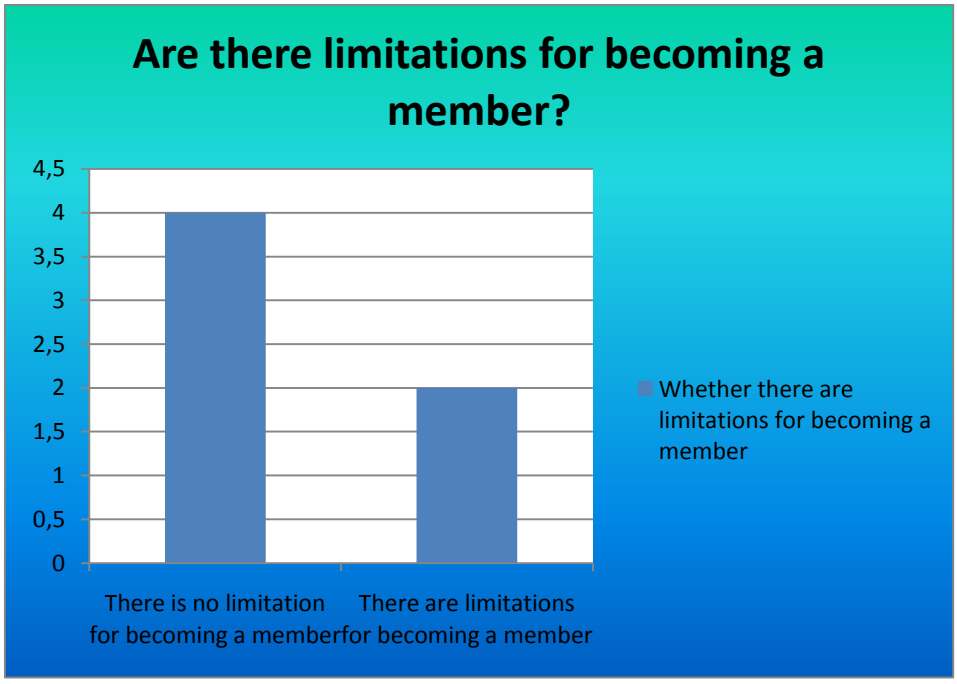

Figure 22, whether there are limitations for becoming a member.

Among those wind cooperatives who states that they do have limitations for becoming a member, the Canadian wind cooperative's requirement is that the applicants must be local residents, while the German wind cooperative explain that they are a closed cooperative and do not accept any new members any more.

The British wind cooperative answers that anyone can become a member for £1, which gives the members a say in how the Trust spends the income within the

community. However, the income benefits all the community, whether a member of the development trust, or not.

The 13th question is whether the wind cooperatives have different type of shares depending on whatever the investor gains revenue on the investment or cheaper priced wind electricity the own consumption.

All of the respondents answer no and the British wind cooperative gives a specific explanation. They reply that “Fintry Model" does not believe that "ability to pay" should allow preferential treatment for those that have money to those who do not.

The result is showed in Figure 23.

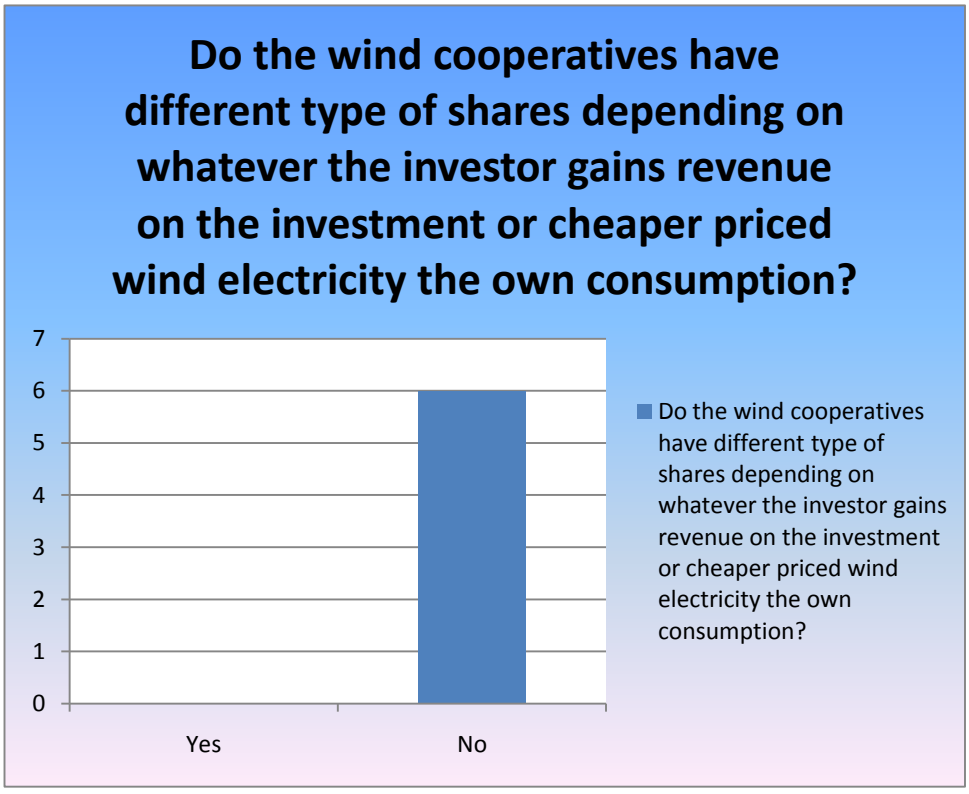

Figure 23, whether the wind cooperatives have different type of shares depending on whatever the investor gains revenue on the investment or cheaper priced wind electricity the own consumption.

I believe the reason is that all of these wind cooperatives sell all the produced electricity to the local utility.

Question 14 aims to find out how much does one share cost for an investor/member.

The members in the Canadian wind cooperative need to pay $175/ 1000KWh yearly for the membership and 5 preference shares ($250 per share), which transferred in EUR is 120 EUR for the membership and 5 preference shares (171 EUR per share). The Danish cooperative A set the price at 4500DKK/1000kWh yearly production at a normal year, which equals to 603 EUR/ 1000KWh yearly. The members of Danish cooperative B need to pay 4250DKK/1000kWh yearly per share, in EUR it is 570 /1000kWh yearly per share. For the members of Danish wind cooperative C, they have to pay 4995 DKK/1000kWh (670 EUR) yearly. For the British wind cooperative, the situation is different. They claim that there are no shares - £1 membership entitles the member to the same say regardless of their personal financial circumstances.

Question 15 asks the wind cooperatives whether the number of shares somehow limited that one investor/member can own.

Except the British wind cooperative, all of the respondents answer no.

The result shows in the Figure 24.

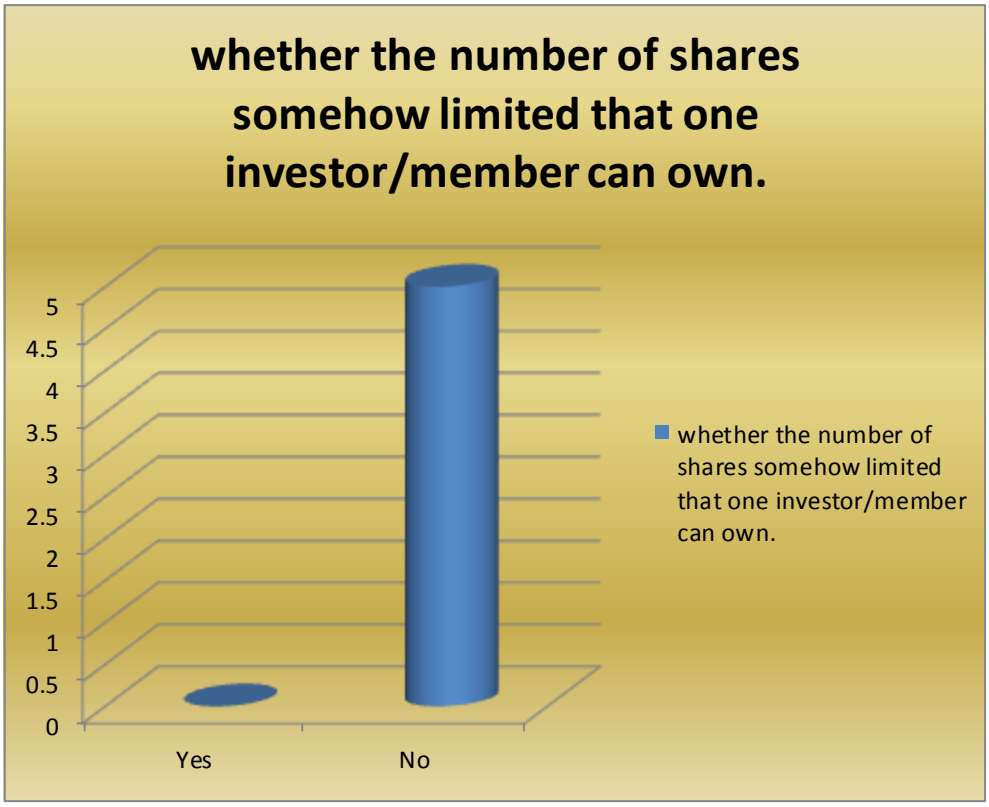

Figure 24, whether the number of shares somehow limited that one investor/member can own.

Question 16 aims to investigate the revenue on investment (ROI) in percentage the wind cooperatives paid per annum for the investors/members.

The Canadian and British wind cooperative did not answer this question. The Danish wind cooperative A pays 10% of the revenue to the members in recent years. For now, Danish wind cooperative B pays 8% of the revenue to its members. The Danish wind cooperative C offers 13.6% of their revenue to the members yearly. And the German wind cooperative pays 8% of revenue.

The result is showed in Figure 25.

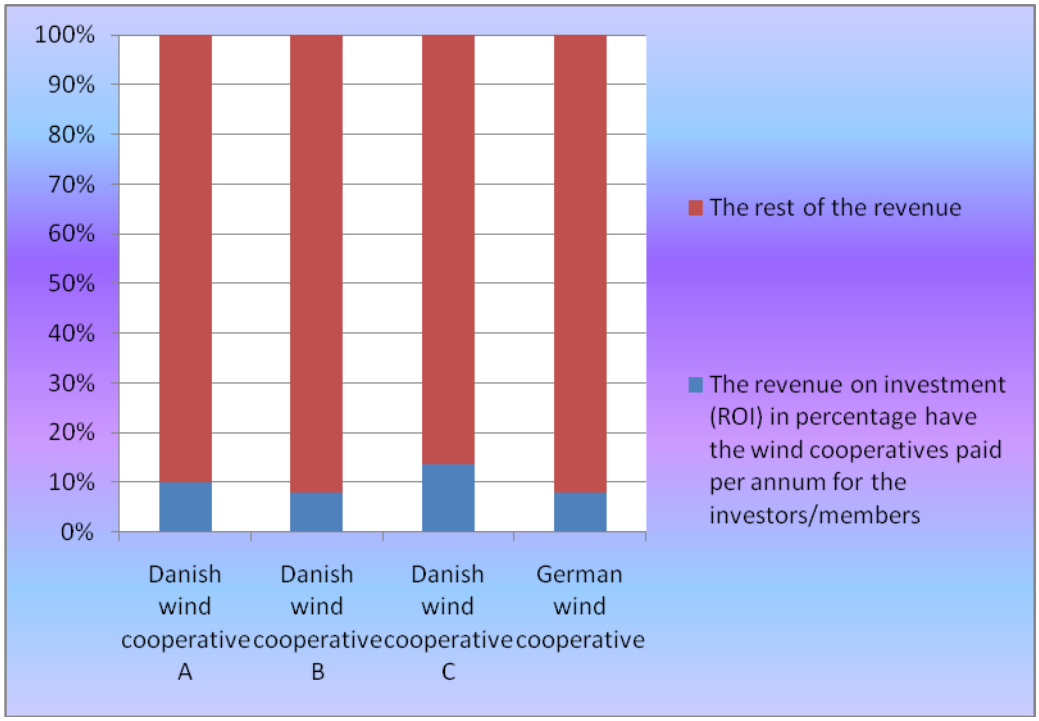

Figure 25, the revenue on investment (ROI) in percentage the wind cooperatives paid per annum for the investors/members.

In this question, the Danish wind cooperative A and B also provide a detailed information about how to distribute the revenue in history.

The Danish wind cooperative A answers that in DK the wind cooperatives receive a higher incentive the first year and after some years get to market price, today all goes to market price at the very beginning. In the first 6 years the members got about 15%, now 10%. And for the Danish wind cooperative B, in the first 6 years the members got about 14%, going down to 10% now after 10 years 8%.

The result is showed in Figure 26.

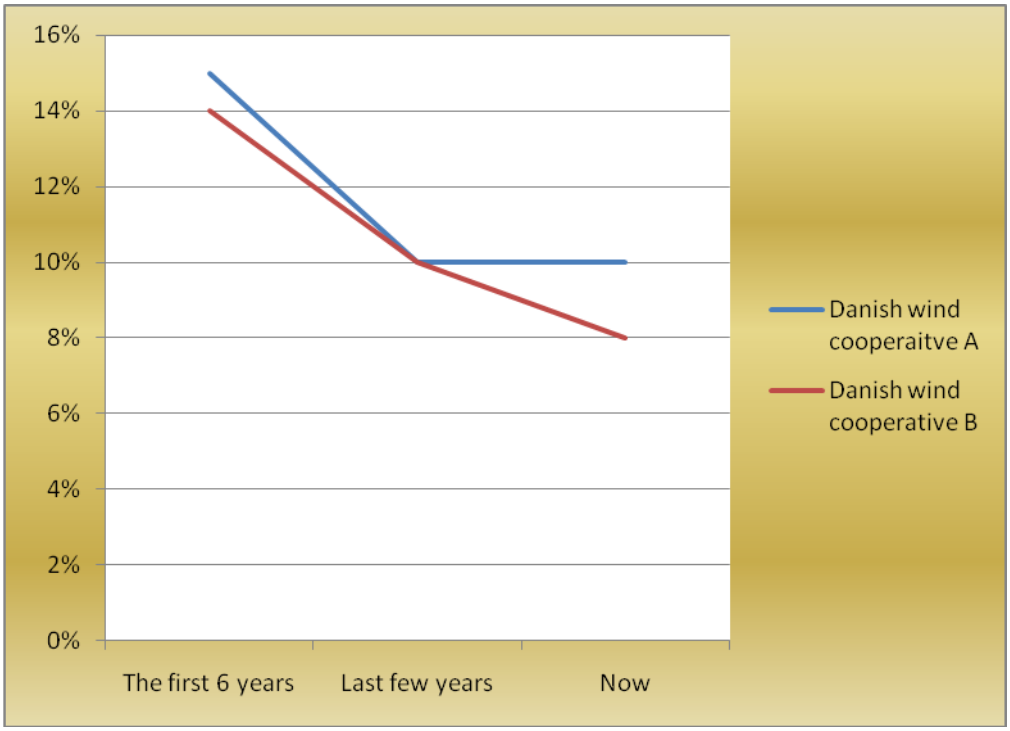

Figure 26, the variation of the revenue on investment (ROI) in percentage that the Danish wind cooperative A and B paid per annum for the investors/members.

About the question 17, if the investors/members have had an opportunity to buy cheaper cost price electricity how much discount have they gained per kWh, all of the respondents answered no.

The result is showed in Figure 27.

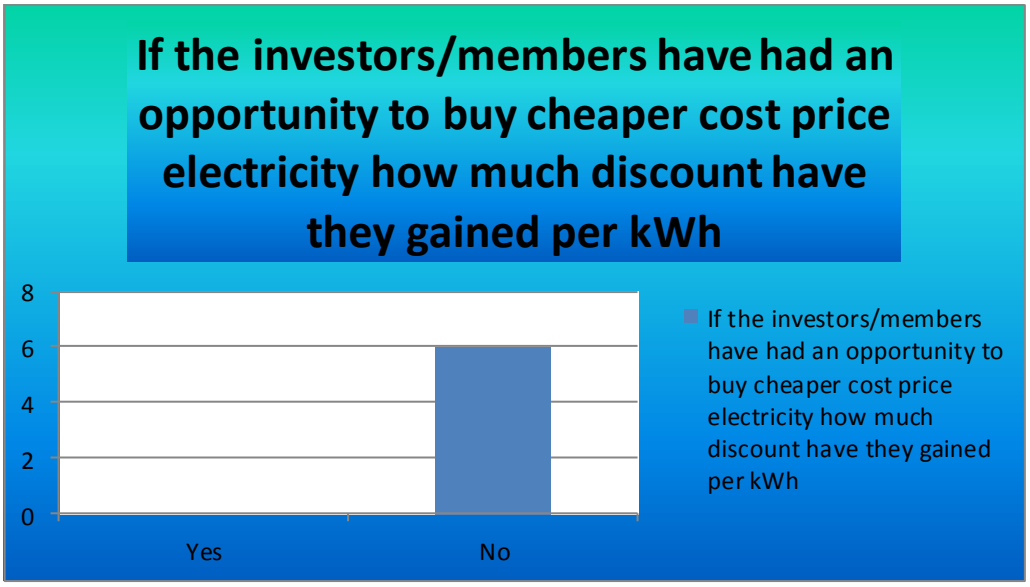

Figure 27, if the investors/members have had an opportunity to buy cheaper cost price electricity how much discount have they gained per kWh.

In my opinion, it is due to the members and the cooperatives all agree to only sell all the produced electricity to the local utility.

Question 18 is about how the wind cooperatives deal with the depreciation of the wind turbines. I offered two options for this question:

- We have paid annually a sum back to the investors/members that are equal with the annual decrease in wind turbine value.
- We have placed the money equal with the annual depreciation to a fond/bank account for a new wind turbine purchase after the life time of the current ones.

The Canadian wind cooperative chose the first option. The German and British wind cooperatives deal with the depreciation as the second option states. However, all of the three Danish wind cooperatives claim that they set aside the needed money for large maintenance cost since the wind turbines getting old in the fifth year.

The result of this question is showed in Figure 28.

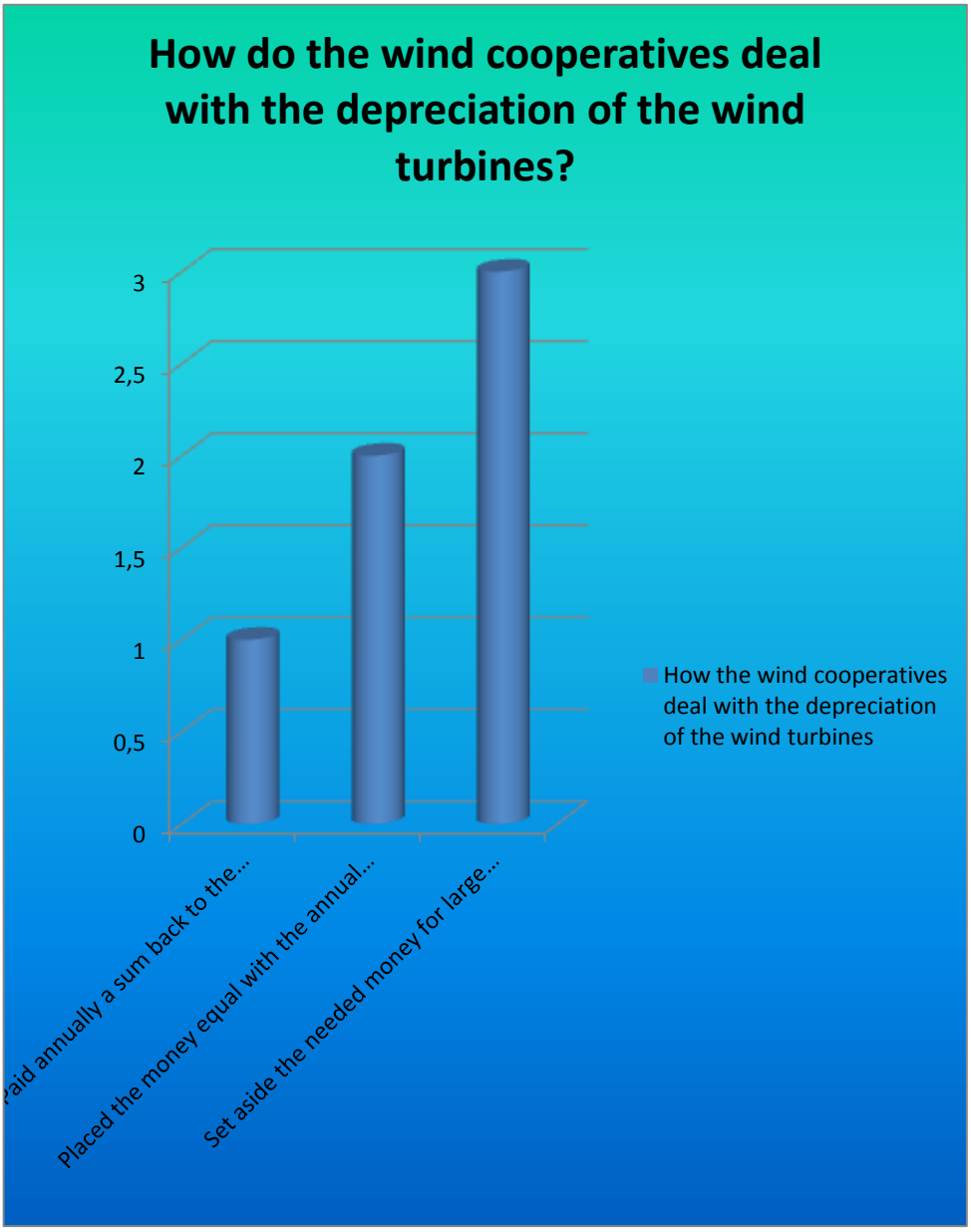

Figure 28, the way wind cooperatives deal with the depreciation of the wind turbines.

Question 19 asks whether the wind cooperatives think that the legislation policy in their countries supports the wind community.

The Canadian wind cooperative answers yes but feel that the support is not enough. They think there should be more legislation policies to support the development of the wind community as wind community is positive to environment and social communities, however due to the high initial costs and technical issues, it doesn't have much strength to compete with the transitional energy industry. The British wind cooperative admits that since the SNP (Scottish National Party) have been in control of the Scottish Government, they bring the wind communities in Great Britain more legislation supports. The rest of the respondents are satisfied with the legislation supports provided by their governments.

Graph 24 illustrates the result of Figure 29.

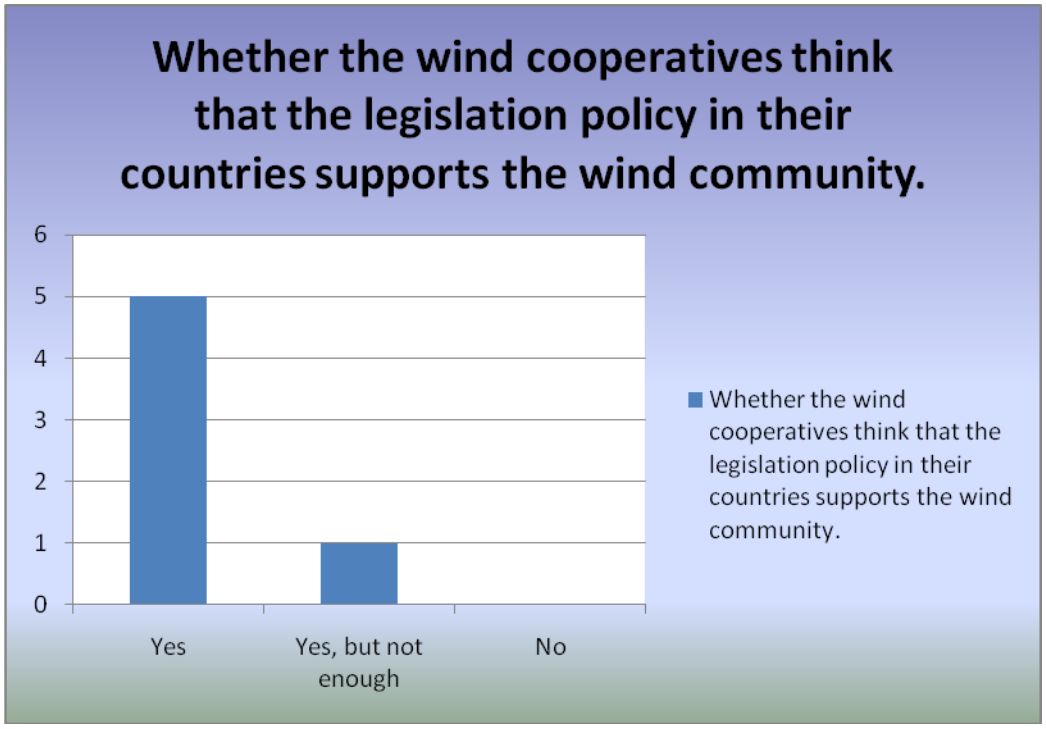

Figure 29, whether the wind cooperatives think that the legislation policy in their countries supports the wind community.

We can see from the result that each wind cooperative in this survey received the legislation support in varying degrees. The legislation support from the government is essential for the wind cooperatives.

Question 20 asks the wind cooperatives whether the taxation policy provides you advantages compared to the other energy industry.

Most of the respondents do not think so. Except German wind cooperative, all the other respondents answer that the Government does not provide them enough support on taxation comparing to other energy industry. However, the three Danish wind cooperatives claim that they do not get the taxation support they deserve, but they have special simplified tax system giving people with a small numbers of shares the advantage.

The result of this question is showed in Figure 30.

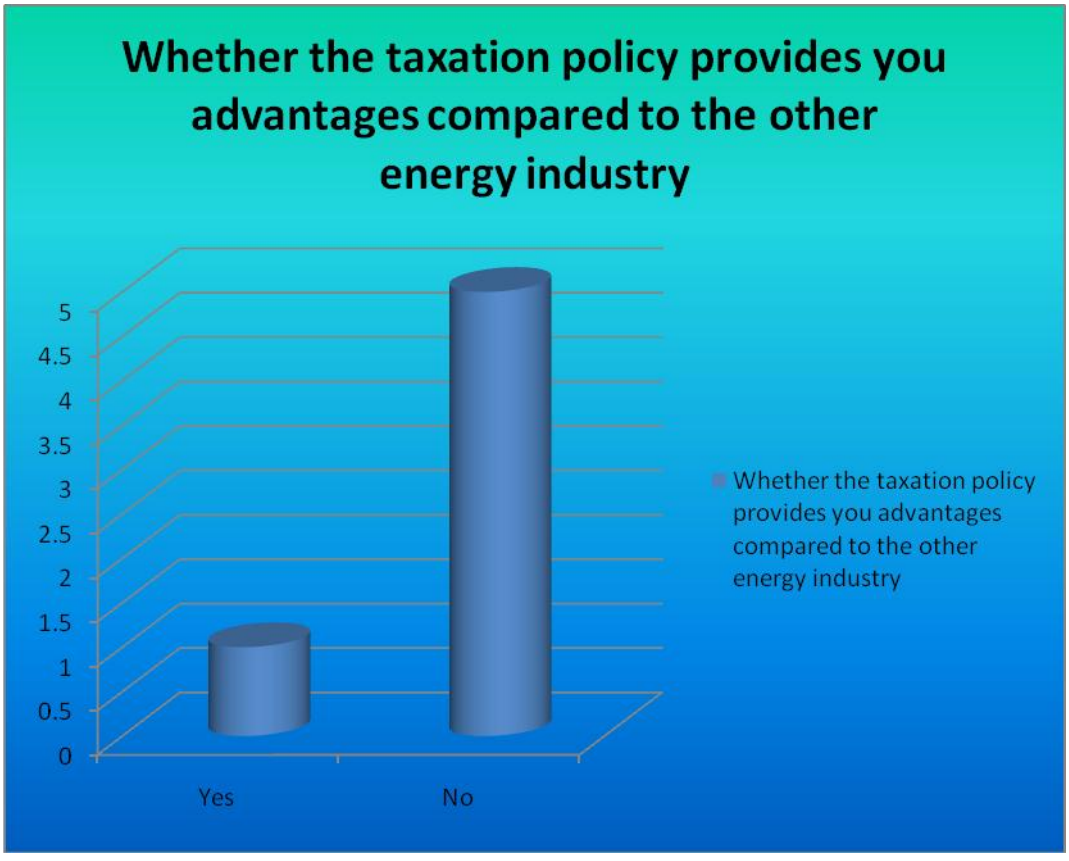

Figure 30, whether the taxation policy provides you advantages compared to the other energy industry.

The question 21 is about how the landowners compensated.

The Canadian wind cooperative leases an agreement with percentage of income as payment. Danish wind cooperative A states that they paid the fixed fee when they started the project but the owner is partly owned by the Copenhagen Municipality. The Danish wind cooperative B and C established their wind farms on the land belong to the Danish government so they do not need to pay the fee. The German wind cooperative bought the land before they installed the wind turbines. The British wind cooperative claims that the landowners have a separate deal with the wind farm developer.

Question 22 aims to find out what is the major risk for a wind project.

The Canadian wind cooperative believes that the financial issue is their major risk for the wind project. They respond that most of the wind communities in Canada have to borrow money from the other institutes, but they are lucky and raise enough money from members/investors so they do not have to borrow as much. All of the Danish wind cooperatives in this survey consider the maintenance cost as their major risk because they spend a fortune on the maintenance and it is their major burden. On the other hand, the major risk of the German wind cooperative is that there is rumor that the German government will stop the tax advantages. The British wind cooperative worries about they are lacking of wind at their turbine site. They answer that “it's not being flippant - we have had 3 years where we have made a 'profit' but 2 years where we have made a 'loss'.” And when they make a loss, it means it will take longer for them to pay off the £2.5M loan for their wind turbines.

Here Figure 31 shows the result of question 22.

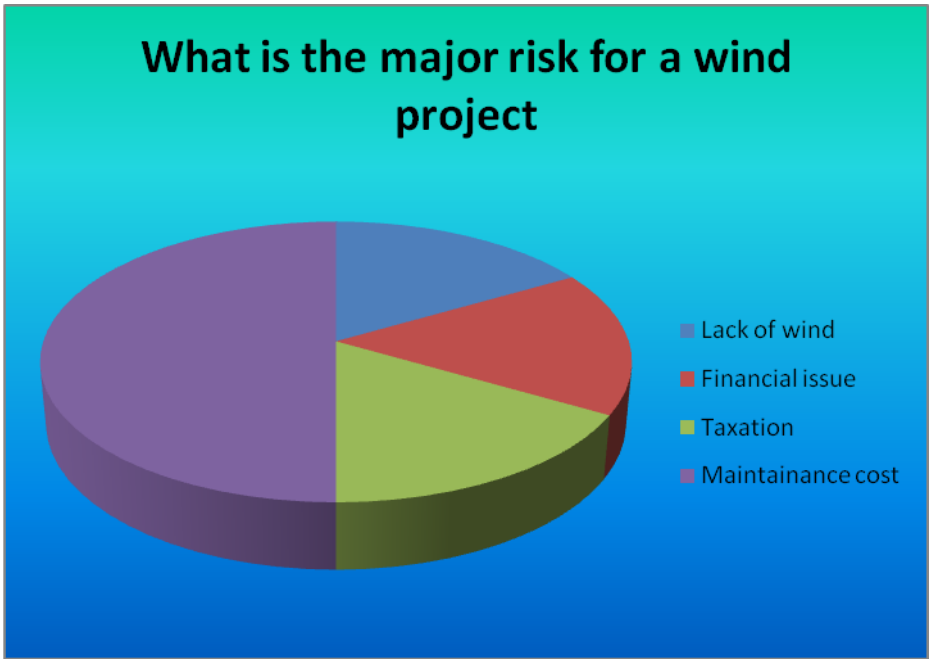

Figure 31, the major risk for a wind project.

Question 23 aims to find out the reason that these wind cooperatives choose a co-operative/community as their business model.

The Canadian wind cooperative chose cooperative as their business model because each member has the right to decide how to operate the business by voting and they think it is the best way to make contribution to the local community and society. The Danish wind cooperative A points out it is the only realistic way in Denmark for more owners than 10. Danish cooperative B at the beginning was force to join an agenda of 21 projects, among which the partnership is the only choice for them. But soon they realized that one owner one share mechanism is a good way for a small size business. Danish wind cooperative C chose wind partnership as their business model because they wanted to join the NGO project where this method is the only acceptable business model. German wind cooperative was formed in GmbH&Co.KG (Public Limited Company+partnership) because they believe it is the best business model for a wind cooperative in German and there are no other possibilities to finance a wind park. The British wind coop-

erative states that under the cooperative model, it is the fairest way to distribute the benefits to the widest possible grouping of the community.

Questions 24 and 25 concern the advantages and disadvantages with a cooperative/community owned wind power.

The Canadian wind cooperative thinks the biggest advantage of cooperative owned wind power is the reason they chose this model as their business model. Every member in the wind cooperative has the right to make decision and it is a good way to reward to the community. On the other hand, they worry that the cooperative is not a very well understood business model which may cause trouble and affect their business in the future. They consider this is the biggest disadvantage of a cooperative.

The Danish wind cooperative A believes the biggest advantage is both the members and the local community can benefit from the wind production, which gets them the support from local residents. They also mention in the answer that they have more planning time for the wind farm due to the wind cooperative business model. In their opinion, the biggest disadvantage is that at the beginning for a wind cooperative, it was hard to collect money until this model and their purpose was understood by the local residents and became their members, then the business started running smoothly.

Coincidently, the Danish wind cooperative B and C both think the biggest advantage is the support from the local government. When they involved in the wind project from the very beginning, the local society gives the residents an informal planning before the planning process get up to the politician, create a knowledge about wind in the society avoiding people get frighten by not knowing anything about wind. In their consideration, the biggest disadvantage is under this model it is hard to raise money at the beginning. Because of lacking of money at the beginning they have to share 50% of the project with the utility having funding upfront and willing to take the risk.

The German wind cooperative points out the biggest advantage of running business under the cooperative business model is that each member does not need to bear the risk alone and every member shares the business risk. The major disadvantage for them is that they can only make decision together which they think is inefficient and annoying.

In the British wind cooperative's opinion, the biggest advantage of running business under this kind of business model is fairness. Their cooperative is a totally transparent and open process where all of the community can clearly see where the money is being spent. The main disadvantage they complain about is the vagaries of special interest groups trying to hijack the income stream for their own narrow requirements.

Figure 32 shows the result of question 24 and 25.

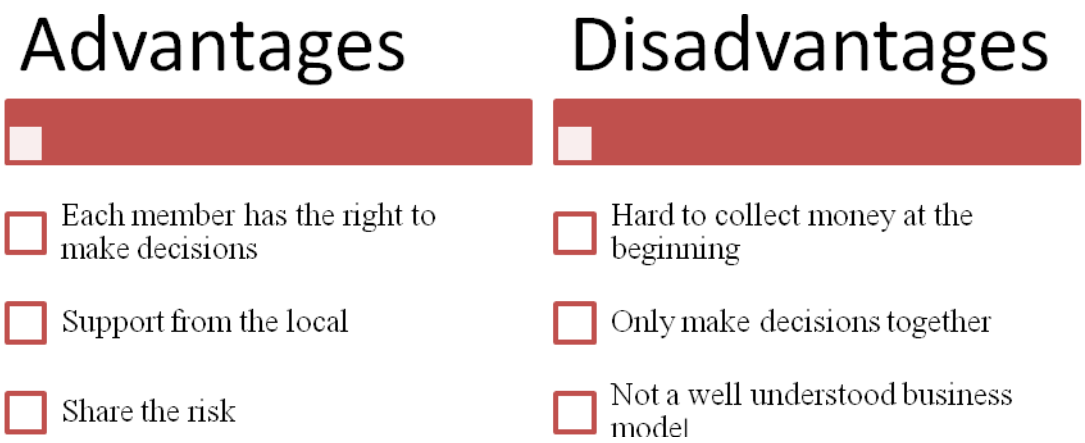

Figure 32, the advantages and disadvantages with a cooperative/community owned wind power.

The question 26 asks the suggestion according to these wind cooperatives' experience.

According to this question, 5 of the 6 respondents suggest that a wind cooperative should always keep the community informed and engage with them at all levels.

The Danish wind cooperative B suggests that high acceptance of wind energy and involving from the very beginning the local society should be kept and gives thereby an informal planning before the planning process get up to the politician, create a knowledge about wind in the society avoiding people get frighten by not knowing anything about wind. According to the German wind cooperative's experience, they believe buying big turbines can only be handled in cooperatives.

Figure 33 shows the suggestion according to these wind cooperatives' experience.

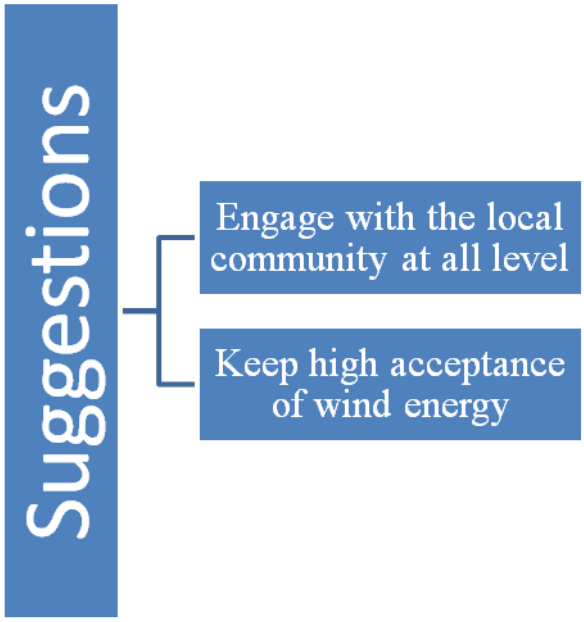

Figure 33, the suggestions according to these wind cooperatives' experience.

The last question asks the wind cooperatives whether they have anything special they would like to mention concerning community/cooperative owner wind power.

The Canadian wind cooperative states that wind cooperative enable a small number of people to do a large amount of work. And the British wind cooperative introduces their unique cooperative model to us: the Fintry Development Trust was set up to utilize the income stream from "our turbine" to specifically deal with the issues of fuel poverty within our rural community & the aim is to make local environment a carbon neutral village - the entire income is spent on insulating homes, providing renewable heating systems etc.

4 CONCLUSIONS

In the final chapter of the thesis, the result of the research will be presented, and the conclusion will be drawn.

This study aims to solve the research problem that how the cooperative owner model in wind energy production has been globally exploited. In order to achieve this purpose, there was a need to know:

1. In which countries are there wind energy cooperatives?

2. How has the cooperative model been utilized (How capital is collected, how profits are divided etc.)?

3. What are the pros and cons that foreign actors have experienced concerning the cooperative business model?

4. What can we learn from foreign experiences when importing the cooperative model to Finnish wind energy industry?

4.1 Research Results

The result of question 1 in the survey shows the business model of each wind energy cooperative in different countries (see Figure 11: *The location of the respondents* and Figure 12: *The business models in this survey*).

The results of question 3, 4, 5, 6, 8, 9, 10 show us the basic information of the wind cooperatives and give us an image of their business scale (see Figure 14: *The amount of turbines owned by each wind cooperative*, Figure 15: *the total production capacity in megawatts (MW) of the respondents' business*, Figure 16: *the annual electricity production in megawatt hours (MWh)*, Figure 18: *the average selling price for electricity per MWh of the wind production (EUR/MWh)*, Figure 19: *the average investment cost per MW for wind turbines*).

The result of question 2, 11, 13 reveals how the wind cooperatives collect capital (see Figure 13: *The owner structure of co-operative wind power organizations*,

Figure 21: *the way the wind cooperatives financed their investment,* and Figure 23: *whether the wind cooperatives have different type of shares depending on whatever the investor gains revenue on the investment or cheaper priced wind electricity the own consumption*)

The results of question 19, 20, 22 indicate the facts that will affect the business of wind cooperatives (see Figure 29: *whether the wind cooperatives think that the legislation policy in their countries supports the wind community,* Figure 30: *whether the taxation policy provides you advantages compared to the other energy industry*, Figure 31: *the major risk for a wind project*).

In the survey, the pros and cons of the cooperative business model have been investigated in question 24, and 25 (see Figure 32: *the advantages and disadvantages with a cooperative/community owned wind power*).

In the last question in the survey, the respondents provide suggestions about running wind cooperatives according to their own experiences (see Figure 33: *the suggestions according to these wind cooperatives' experience).*

4.2 Study Conclusion

In the first introduction chapter, readers have an overview on the study background, research problem and questions, and the thesis structure.

In the second chapter I put emphasis on the theory of cooperative, wind energy, and wind energy cooperative. The first part of the second chapter starts with the history and definition of cooperative, then goes to the advantages of running business under a cooperative business model and introduces the different types of cooperative models to the readers. The second part of chapter 2 mainly aims at give an impression of wind energy to the readers. This part contains the basic information of wind energy, its development, the current situation and future prospects of wind energy in the world and in Europe. The economic and business potential of wind energy are also described in this part. The third part is the most important part in this chapter; the reader can acquire the different wind cooperative models in this part.

In chapter 3, the survey aiming to find out the research problem: how cooperative owner model in wind energy production has been globally exploited was analyzed. In this chapter, the capital collecting method, the revenue delivery method of the wind cooperatives was revealed. The pros and cons of running business under the cooperative business model were also dig out. Besides of these, the readers will have a clear thought about the factors that affect the wind cooperative business after read this chapter.

The fourth chapter which is the last one concludes the study and gives final suggestions.

4.3 Suggestions for the Future Finnish Wind Cooperatives

In the end, the suggestions and thoughts brought up by my research experience are added here:

- Wind energy is a developing field which deserves both technical support and government support.
- The legislation and taxation are the most essential factors that affect wind business. When a developer decides to form a wind cooperative, he must consider whether there are the legislation support and taxation support for wind energy in the country.
- Inform the local community all the time and engage with them at all levels. The reason why wind cooperative are popular in some countries such as Denmark, German, is that they are accepted and supported by the local residents.

REFERENCES

Co-operative College (2010). The Rochdale Principles [Online]. Co-operative College [Accessed 31.03.2011]. Available from the internet: <URL: http://www.co-op.ac.uk/our-heritage/rochdale-pioneers-museum/about-the-museum/the-rochdale-principles/ >

European Wind Energy Association - EWEA (2011), Comparaison of energy growth and decline in 2009 [Online]. European Wind Energy Association. [Accessed 14.04.2011]. Available from the internet: <URL: http://www.ewea.org/ >

German Wind Energy Association (BWE) (2011), EU member state market shares for new capacity installed during 2010 [Online]. German Wind Energy Association. [Accessed 14.04.2011]. Available from the internet: <URL: http://www.wind-energie.de/en/news/article/wind-in-power-2010-european-statistics/166/ >

Greg Pahl (2007). The Citizen-powered Energy Handbook: Community Solutions to a Global Crisis. White River Junction, VT: Chelsea Green Pub. Print.

Global Wind Energy Council (2011). Board Members [Online]. European Wind Energy Association. [Accessed 14.04.2011]. Available from the internet: <URL: http://www.gwec.net/index.php?id=37&L=hytfykxckcvagce>

Global Wind Energy Council (2011). EUROPEAN UNION [Online]. European Wind Energy Association. [Accessed 14.04.2011]. Available from the internet: <URL: http://www.gwec.net/index.php?id=127>

Global Wind Energy Council (2011). North America [Online]. European Wind Energy Association. [Accessed 14.04.2011]. Available from the internet: <URL: http://www.gwec.net/index.php?id=24&L=0%EF%BF%BD>

Global Wind Energy Council (2011). GERMANY [Online]. European Wind Energy Association. [Accessed 14.04.2011]. Available from the internet: <URL: http://www.gwec.net/index.php?id=129&L=0%25252525B4>

Global Wind Energy Council (2011). UNITED KINGDOM [Online]. European Wind Energy Association. [Accessed 14.04.2011]. Available from the internet: <URL: http://www.gwec.net/index.php?id=135&L=0%2525252525252Findex.php%2525252525253Fid%2525252525253Dhttp%2525252525253A%2525252525252F%2

525252525252Fmusicadelibreria.net%2525252525252Ffooter%2525252525253F%2525252525253F>

Global Wind Energy Council (2011). SWEDEN [Online]. European Wind Energy Association. [Accessed 14.04.2011]. Available from the internet:
<URL: http://www.gwec.net/index.php?id=134&L=0%25B4>

Global Wind Energy Council (2011). CANADA [Online]. European Wind Energy Association. [Accessed 14.04.2011]. Available from the internet:
<URL: http://www.gwec.net/index.php?id=120&L=0%C2%B4 >

Global Wind Energy Council (2011). Wind energy makes sound economic sense [Online]. European Wind Energy Association. [Accessed 14.04.2011]. Available from the internet:
<URL: http://www.gwec.net/index.php?id=137>

Global Wind Energy Council (2011). The world's wind resource [Online]. European Wind Energy Association. [Accessed 14.04.2011]. Available from the internet:
<URL: http://www.gwec.net/index.php?id=148&L=0%2525252525B4>

Global Wind Energy Council (2011). Growth of the world's wind energy installed capacity [Online]. European Wind Energy Association. [Accessed 14.04.2011]. Available from the internet:
<URL: http://www.gwec.net/index.php?id=37&L=hytfykxckcvagce>

INFO - Bangladesh Alternative Energy System (2010) [Online]. 2010 Bangladesh Alternative Energy System Pvt. Ltd. [Accessed 14.04.2011]. Available from the internet:
<URL: http://www.baes-ltd.com/wind_power.html>

International Co-operative Alliance (ICA) (2010). Statement on the Co-operative Identity. [Online]. International Co-operative Alliance (ICA) [Accessed 28.03.2011]. Available from the internet:
<URL: International Co-operative Alliance (ICA)>

John R. Fanchi (2011). Energy in the 21st Century. Hackensack, NJ: World Scientific, Print.

J. F. Manwell, J. G. McGowan and A. L. Rogers. (2002). Wind Energy Explained: Theory, Design and Application. Chichester, U.K.: Wiley, Print.

Mark Bolinger (2001). Community Wind Power Ownership Schemes in Europe and their Relevance to the United States [Online]. Lawrence Berkeley National Laboratory. [Accessed 14.05.2011]. Available from the internet:
<URL: http://eetd.lbl.gov/EA/EMP/ >

McFadzean, John (2008). The Co-operators - A History of the Fenwick Weavers. [Online]. East Ayrshire North Communities Federation Ltd [Accessed 28.03.2011]. Available from the internet:
<URL: http://en.wikipedia.org/wiki/Fenwick_Weavers'_Society>

OurFernie coop (2010). Co-operative advantages [Online]. OurFernie coop [Accessed 01.04.2011]. Available from the internet:
<URL: http://www.ourfernie.com/co_op_advantages >

Paul Gipe (1995). Wind Energy Comes of Age. New York: Wiley, Print.

Regents of the University of Michigan (2011). The Cooperative Movement. [Online]. Regents of the University of Michigan [Accessed 28.03.2011]. Available from the internet:
<URL: http://www.umich.edu/~nasco/OrgHand/movement.html>

Todd Woody (2011). Wind power now competitive with coal in some regions. [Online]. Grist Magazine, Inc. [Accessed 28.03.2011]. Available from the internet:
<URL: http://www.grist.org/article/2011-02-07-report-wind-power-now-competitive-with-coal-in-some-regions>

V. Ryan (2009). Advantages And Disadvantages Of Wind Power [Online]. www.technologystudent.com. [Accessed 22.03.2011]. Available from the internet:
<URL: http://www.technologystudent.com/energy1/wind8.htm >

Vaughn Nelson (2009). Wind Energy: Renewable Energy and the Environment. Boca Raton: CRC, Print.

VAMK (2011). Network Learning Environments [Online]. [Accessed 31.05.2011]. Available from the internet:
<URL:http://www.puv.fi/en/study/atk-aapinen/e-learning/>

Wikipedia (2011). Energy development [Online]. Wikimedia Foundation, Inc. [Accessed 31.03.2011]. Available from the internet:
<URL: http://en.wikipedia.org/wiki/Energy_development>

Wikipedia (2011). Cooperative [Online]. Wikimedia Foundation, Inc. [Accessed 31.03.2011]. Available from the internet:
<URL: http://en.wikipedia.org/wiki/Cooperative#cite_note-ica-principles-1>

Wikipedia (2011). History of the cooperative movement [Online]. Wikimedia Foundation, Inc. [Accessed 31.03.2011]. Available from the internet:
<URL: http://en.wikipedia.org/wiki/History_of_the_cooperative_movement >

Wikipedia (2011). Economic of Scale [Online]. Wikimedia Foundation, Inc. [Accessed 20.03.2011]. Available from the internet:
<URL: http://en.wikipedia.org/wiki/File:Economies_of_scale.PNG >

Wikipedia (2011). Co-operative economics [Online]. Wikimedia Foundation, Inc. [Accessed 31.03.2011]. Available from the internet:
<URL: http://en.wikipedia.org/wiki/Cooperative_economics>

World Wind Energy Association WWEA (2011), World Wind Energy Report 2010 [Online]. World Wind Energy Association. [Accessed 14.04.2011]. Available from the internet:
<URL:
http://www.wwindea.org/home/images/stories/pdfs/worldwindenergyreport2010_s.pdf>

WPS Construction (2011). History of Wind Power [Online]. WPS Construction. [Accessed 22.03.2011]. Available from the internet:
<URL: http://www.wind-turbine-installation.com/ >

Worldpress.org (2011). Wind Energy: An Overview [Online]. Worldpress.org [Accessed 22.03.2011]. Available from the internet:
<URL: http://www.worldpress.org/Americas/2482.cfm >

Windshare (2011), What Is a Wind Power Co-op? [Online]. Windshare. [Accessed 14.04.2011]. Available from the internet:
<URL: http://www.windshare.ca/about/what_is_a_wind_power_coop.html >

Windustry (2010), Community Wind [Online]. Windustry. [Accessed 14.05.2011]. Available from the internet:
<URL: http://www.windustry.org/about-windustry/about-windustry >

Windustry (2011). Community Wind Toolbox Chapter 11: Choosing a Business Model [Online]. Windustry [Accessed 14.05.2011]. Available from the internet:
<URL: http://www.windustry.org/your-wind-project/community-wind/community-wind-toolbox/chapter-11-choosing-a-business-model/communi >

Windustry (2011). Community Wind Toolbox Chapter 12: The Minnesota Flip Business Model PDF Version [Online]. Windustry [Accessed 14.05.2011]. Available from the internet: <URL: http://www.windustry.org/your-wind-project/community-wind/community-wind-toolbox/chapter-12-the-minnesota-flip-business-model>

We are doing a research program here in Finland within several universities in the city of Vaasa, where we are studying how a community/cooperative owned wind energy business model has been applied in several countries. There are no wind energy cooperatives on the mainland of Finland and one of our aim is to support the establishment of cooperatives as a new business model to Finnish wind energy business. We would greatly appreciate it if you could participate in this survey and if you give your email address at the end of the survey we will provide you an executive summary of the results.

1. In what country do you operate and what type of a cooperative or community owned wind power business model do you have?

Sweden

☐ • sammfällighet (the real estate based owner model)

☐ • ekonomisk förening (an economical association)

☐ • Some other form

Some other form: 

Germany

☐ • GmbH&Co.KG (Public Limited Company+partnership)

☐ • Co-operative model

☐ • Some other form

Some other form: 

Denmark

☐ • Co-operative partnership model

☐ • Some other form

Some other form:

Great Britain

☐ • Industrial and provident society (co-operative)

☐ • Public limited company

☐ • Some other form

Some other form:

United States

☐ • Co-operative

☐ • Limited liability company

☐ • Flip- model

☐ • Some other form

Some other form:

2. Who belong to the owner structure of you community/co-operative wind power organization?

%

• Private persons: owning shares of ☐

• Companies: owning shares of ☐

• Municipalities and other tax financed institutions: owning shares of ☐

• Other legal institutions: : owning shares of ☐

3. How many wind turbines does your cooperative/community wind power organization own?

☐

4. What is total production capacity in megawatts (MW) of your business?

a. in operation now: ☐

b. planned: ☐

5. What is your annual electricity production in megawatt hours (MWh)?

☐

6. What is the average wind speed at your operation site(s)?

☐ 6-10m/s

☐ 11-15m/s

☐ 16-20m/s

☐ 21-25m/s

☐ more than 25m/s

7. Do you sell all the produced electricity or do you use some part of it on your own?

☐ Sell all the produced electricity

☐ Use for our own

☐ Sell part of the produced electricity and use some part of it

8. What is the average selling price for electricity per MWh of your wind energy production?

9. What has been the average *investment cost* per MW for your wind turbines?

10. What have been your annual average operation and maintenance (O&M) costs per MWh?

11. How have you financed the investment?

	%
Cash from the investors/members	
By a bank loan	
By subsidies from the government	

12. Are there any limitations for becoming a member or investor to your co-operative or community owned wind power business?

13. Do you have different type of shares depending on whatever the investor gains revenue on the investment or cheaper priced wind electricity for his/hers own consumption?

14. How much does one share cost for an investor/member?

15. Is the number of shares somehow limited that one investor/member can own?

16. How much revenue on investment (ROI) in percentage have you paid per annum for the investors/members?

17. If the investors/members have had an opportunity to buy cheaper cost price electricity how much discount have they gained per kWh?

18. When the wind turbine starts getting older it also looses value. How have taken this to account?

☐ We have paid annually a sum back to the investors/members that is equal with the annual decrease in wind turbine value

☐ We have placed the money equal with the annual depreciation to a fond/bank account for a new wind turbine purchase after the life time of the current ones

19. Do you think the legislation policy in your country supports your wind community?

20. Do you think the taxation policy provides you advantages compared to the other energy industry?

21. How are the landowners compensated?

22. What do you consider as the major risk of your wind project?

23. Why did you choose a cooperative/community as your business model?

24. I think the biggest advantages with a cooperative/community owned wind power are:

25. I think the biggest disadvantages with cooperative/community owned wind power are:

26. According to our experience it is important with community/coopeative owned wind to:

27. Is there anything special that you would like to mention concerning community/cooperative owner wind power?

Your email address if you wish to get the summary of the research results