PROMOTION OF ELECTRICITY FROM RENEWABLE ENERGY SOURCES IN FINLAND

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Abstract

The main purpose of this case was to study the development of energy projects from renewable energy sources and green energy promotion in Finland. A further aim was to establish whether the development takes purely economic turn and if there is a need for improvement of green energy promotion.

The research was based on comparison and analysis of wind energy development in Finland, Germany and the Netherlands. Special attention was given to the development of promotional strategies and policy instruments to encourage electricity from renewable energy sources.

Electricity market is no longer a completely free market and various subsidies, taxation and feed-in tariff have a considerable effect on the electricity prices. A general tendency was identified that, nowadays, there is a need not only for government incentives for RES electricity but also for the marketing activities from the side of energy suppliers. In Finland, consumers are willing to participate in green electricity promotion by paying premium but the number of green electricity consumers is still rather low. More active approach in promotion and marketing is required. Present situation at Finnish energy market represents a big challenge as well as a big opportunity for green electricity producers.

Table of Contents

Figures

Tables

Table of terms

Biofuels: Mainly includes woods, biodiesel and bioethanol

Biomass: Includes solid biomass, biowaste and biogas

CHP: Combined Heat and Power

CO_2: Carbon dioxide

ETSO: European Transmission System Operators

Feed -in -tariff: Government support for RES promotion

GWh: Gigawatt-hour

MWh: Megawatt Hours

RES: Renewable energy sources

RES-E: Electricity production from renewable energy sources

RES-H: Production of heat and cold from renewable energy sources

*KW: K*ilowatt

PJ: Petajoule

TWh: TeraWatt Hour

Nord Pool: The common power market for Sweden, Finland Norway, and Denmark.
Fingrid: Finnish national electricity transmission grid operator

Introduction

Finland is a country of steady economic growth and industries demanding stable energy supply. The competitiveness of Finnish industries is highly dependant on the availability and price of energy. Finnish industries use almost EUR 3.4 thousand million worth of energy a year, more than half of which consists of electricity and heat. Energy accounts for approximately five percent of the acquisition costs of industrial input. Finnish industries consume more than half of all electrical energy in Finland; most of this is used by the wood-processing industry. (Finnish Energy Industries Federation FINERGY, 2002)

In the situation of high demand for energy and insufficient domestic energy production, the decision on the energy sector development becomes crucial. At the same time as Finland is trying to satisfy its constantly growing demand for energy, it also must satisfy carbon dioxide emission parameters. The last factors bring special attention to emission -free renewable energy sources (RES). Price of electricity from RES sources is usually higher than average so RES should be promoted already now to support their further development.

The author for her thesis work chose Finland because it is very energy dependant and its own energy sources are rather limited. At the same time, it is a very technologically advanced country, which experience in the energy sector may be used later as an example for similar cases. The main research question is going to cover the present situation of alternative energy sources in Finland and their future. The author is going to study the process of RES economic development and actions taken to market green electricity in Finland.

Finland has to find the way of sufficient energy production to avoid economical and political dependences on other countries. In the given work, this situation is displayed by the example of Russia-Finland energy relations. Although present business connections are strong and profitable, Finland should be careful not to become a hostage of energy dependence in the future.

Nowadays Finnish government is supporting companies to develop and use alternative energy methods. Unfortunately, there is no active green electricity marketing campaign targeting general residents of the country. Though there is understanding of necessity for renewable energy, it is still hard to convince the society to make a shift towards heavy use of these methods.

1.0. Literature review

There is a sufficient amount of literature about green energy sources in Finland. A wide range of the Internet sources is presented in the bibliography. The author has carried her research on the basis of numerous annual reports of international committees aiming to promote green energy and develop green policies.

Unfortunately, the amount of literature devoted to the marketing of green electricity in Finland is quite limited and the author looks over general electricity marketing practices in the world.

Forecasts of Finnish energy development are based on the national scenario, developed by VTT Energy in 2003. “Energy Visions 2030 for Finland” gives a complex overview of the future development and allows the government to choose the right way to go.

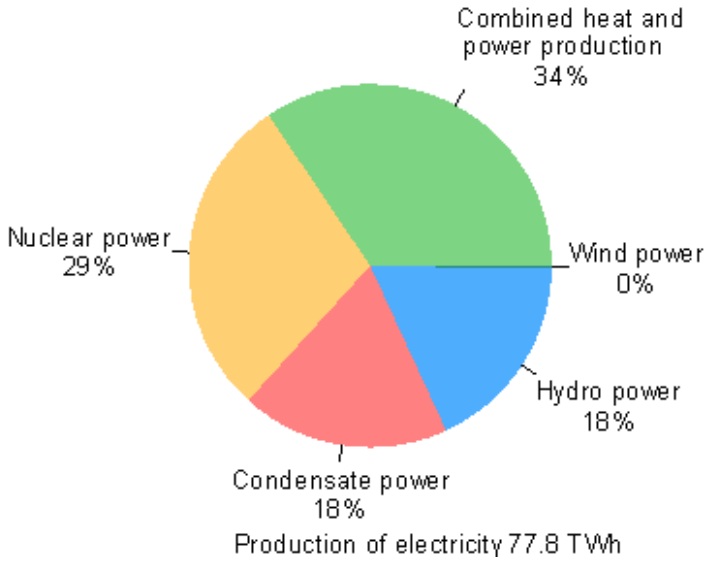
2.0. Finnish energy sector

“The main goals of Finnish energy policy are securing national energy supply, sustaining a competitive energy price, and keeping air pollution and greenhouse gas emissions down below the limits of international commitments.” (Energy Use, p.47)

Finnish electricity market was deregulated in 1995 and became a part of Nordic electricity market. Electricity in Finland is traded at Nord Pool (Nordic energy market) and its price is said to be one of the lowest in Europe. Finland is represented at the market with a rather diversified energy portfolio.

Combined heat and power production and nuclear energy represent the biggest part of energy sources with their 34 percent and 29 percent respectively. Condensate energy represents 18 percent. There was a 24 percent growth in production of hydropower due to rainy years and, consequently, its proportion increased to 18 percent. Production of wind power has growth of 23 percent. The proportion of wind power of total electricity produced remained at 0.2 percent. (Statistics Finland, 2008)

Figure 1
Electricity production by production mode 2007.



Source: Statistics Finland, 2008

According to the information presented by Finnish Energy Industries Federation (2002), electricity accounts for 25 percent of the end use of energy in Finland. There are

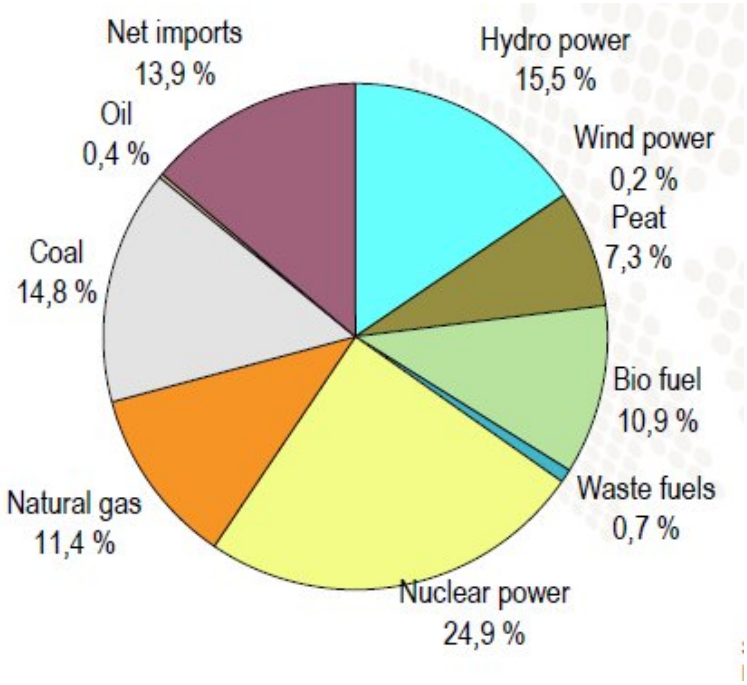
approximately 120 electricity-producing companies and some 400 power plants, more than half of which are hydropower plants.

Being a part of EU zone, Finland is participating in its common energy policy. As a part of this policy, European Heads of State or Government agreed in March 2007 on binding targets to increase the share of renewable energy. “By 2020, renewable energy should account for 20 percent of the EU's final energy consumption (8, 5 percent in 2005). In order to reach the target, each Member State needs to increase its production and use of renewable energy in electricity, heating and cooling. The renewable energy targets are calculated as the share of renewable consumption to gross final energy consumption. Renewable energy consumption comprises the direct use of renewables (e.g. biofuels) plus the part of electricity and heat that is produced from renewable energy (e.g. wind, hydro), while final energy consumption is the energy that households, industry, services, agriculture and the transport sector use. Finnish target: 38 percent (2005 = 28.5 percent)” (Finland renewable energy fact sheet, 2008)

Finnish government is positive in the assessment of its achievements in renewable energy field. Finnish Ministry of Employment and Economy Finland states that Finland is one of the world leading users of renewable sources of energy, especially bioenergy.

According to its information, renewable energy sources provide one fourth of Finland’s total energy consumption and account for more than one fourth of its power generation. “The country’s most important renewable sources of energy include bioenergy – wood and wood-based fuels in particular –, hydropower, wind power, ground heat and solar energy.” (Finnish Ministry of Employment and Economy, 2008)

Figure 2
Electricity production by energy sources in 2007.



Source: Finnish Energy Industries: Energy Year 2007

Finland has achieved its recent renewable energy targets mainly due to the increase of hydropower generation. Unfortunately, energy production figures from this source may vary strongly from year to year. Heavy dependence on fossil fuels still takes place in Finnish energy sector.

The country is investing in R&D for energy sources but the work is mainly done in the sphere of biofuels. The priority is given to wood based fuels because of strong position of paper industry in the country. Wood-based fuels are considered neutral regarding greenhouse gas emissions.

In Finland, wind energy sphere is not so attractive to the investors in comparison to bioenergy industry. Half a year ago, there was no sign that any feed in tariff could be

introduced. There were no government incentives to promote this type of RES and present development is a pure result of initiative of certain energy companies.

The government gives priority to the nuclear power development and the reasons could be found in price and political aspects. Business looks at it as the most convenient way to get relatively low priced energy. Chairman of the Executive Board of Finnish Energy Industries, Mr. Seppo Ruohonen, announced: “Due to self-sufficiency and to the fact that old power plants will be out of date during the next decade, we need to make considerable investments to secure the supply of affordable energy and meet the demands of the climate change as well. Study made by Finnish Energy Industries shows that even if we would considerably increase the production of renewable energy, we will still need two new nuclear power plants and condensing power before the year 2020.” (Energiateollisuus. The price for energy does matter, 2008)

3.0. Finland Russia energy relations

Finland has long lasting and controversial energy relations with Russia. Traditionally, it has a strong economic connection with Russia in the sphere of fuel trade. In 2008, about 72 percent of all imported fuel came to Finland from Russia. The same year Finland imported from Russia 10 883 GWh, which represents 66 percent of all electricity imports for this year. In comparison, Sweden, as the second largest electricity importer to Finland, provided only 3 096 GWh for the year 2008. (Energy Imports by Country of Origin in 2008, 2009)

Analysis of the above-mentioned facts gives a picture of clear dependence of Finland on Russian exports and country’s necessity to search for independent electricity sources.
It would be good to point out that Russian electricity market is undergoing transition stage as well as do Russia’s relations with Finland. There is an evolution of cooperation between Finnish and Russian energy companies.
Nowadays, the leadership in Finland Russia energy trade belongs to OJSK INTER RAO UES. Finland is among its main electricity export destinations.

There is a close cooperation between Finnish and Russian electricity sectors with attempts from the both sides to secure market share and electricity supply by means of ownership of foreign company.

Finnish RAO Nordic OY is a wholly-owned subsidiary of OJSK INTER RAO UES. Finnish Fortum holds minority and majority shareholding in Russian electricity producing companies TGC-1 (25,7 percent) and TGC-10 (94 percent) respectively. Their activities comprise power and heat generation as well as sales in Russia.

Finnish-Russian joint ventures have proved to be not very successful in the recent years. In the pursue of maximum control over the company performance, both sides usually try to gain the majority shareholding. Because of the conflicting interests of Russian and Finnish sides over the decision-making, the form of joint venture is not expected to have high prospects in the future. At the same time, there is a high possibility that there will be substantial growth of sub-contractor relationships and various forms of non-equity cooperation (strategic alliances), in particular linking them to the prospects of multinational power engineering corporations coming to Russia and increased manufacture of licensed equipment. (Filippov P., Yurkovsky V., 2007)

There is a strong belief that there is a huge potential for economic cooperation for both countries in the electricity field. Filippov and Yurkovsky (2007) in their work “Essay on Internationalization Potential of Northwest Russian and Finnish Energy Clusters” claim that Finnish companies may further penetrate Russian market. Finnish companies have advanced R&D base and could bring expertise in cooperative project. Finnish partners in Finnish Russian electricity cooperation are primarily viewed as technology partners and not as financial ones. The researchers have developed an assessment of perspective forms of cooperation between Finnish and Russian companies.

Table 1
Forms of Cooperation.

(1 – the least appropriate, 3 – the most appropriate)

#	Options	Today	In 5-7 years
1	Green field (100% FDI)	1	2
2	Acquisition of majority share	3	3
3	Acquisition of minority share	2	1
4	Majority JV	2	2
5	Minority JV	1	1
6	50-50 JV	2	1
7	Non equity wide scope alliance	1	2
8	Contractual agreement (subcontracting)	1	3
9	Licensing	1	3
10	Sales subsidiary	2	3
11	Export-import	2-3	2-3

Source: Filippov P., Yurkovsky V. (2007) Essay on Internationalization potential of Northwest Russia and Finnish Energy Clusters. [online]

One of the unresolved questions of trade relations between the countries is the electricity price policy. ETSO (European Transmission System Operators) have set high transnational transit tariff for Russian electricity exports to Finland on 01.06.2007. Finnish grid operator is the active member of ETSO. According to the regulations of the latter Russian electricity exports company are obliged to pay higher transition tariff than European members of ETSO.

Natalia Prohorova, the head of the electricity research department of Institute of natural monopolies, points out that Fingrid tariff is more than 10 times higher for Russian exporters than for local producers. (Grishkovez E., Djodjua T., 2007) She states that Russian electricity exports are suffering from discriminative price policy at the Nordic market.

Analysis of the electricity prices at the Finnish market gives the author opportunity to suppose that the above-mentioned ETSO is the protectionist measure from the side of Finnish electricity producers. Average price at Russian domestic electricity market is around €20-25 per 1MWh whereas Scandinavian Nord pool market has it at the level of €35-45 per 1MWh. Such a high price difference could represent a danger for Finnish producers if there would not be highly protective environment in the Nordic energy market. Russian companies are still able to receive profits due to the difference between the prices for domestic and foreign markets. Analyzing trends in Finland Russia energy relations, the author concluded that there are no expectations of any changes in this situation in the near future.

4.0. RES in Finland

The main aim of any country electricity system is the secured constant supply of sufficient amount of moderately priced electricity. Finland with its high proportion of energy-intensive industries and long lasting heating season is not an exception. Nowadays, the country is facing the question of the choice of electricity sources. There is a constant gradual change in the price relationship of RES electricity and the price of fossil fuels. Prices for oil and gas as well as other fossil fuels are becoming more and more expensive and make RES-E more attractive. Carbon Dioxide emissions also start to play the increasingly important role in the formation of electricity strategy of the country. RES are usually regarded as the major way of keeping Carbon Dioxide emissions within the set frames.

Finland is fighting with two main difficulties in its energy sector: CO_2 emissions and secured source of moderately priced power. The second part has a subsector such as a question of country's energy. Finland is traditionally strong in RES-E and holds the third place in EU by the amount of electricity produced by renewables. At the same time, Finnish government goes for nuclear power in order to meet the second challenge that is the secure source of moderately priced power. The association of Finish energy producers

supports this view. The author agrees that it may be an easy way to go to get moderately priced electricity but it may cause many difficulties in the future.

In 2007, the EU members agreed on a common policy to fight climate change and by means of unilateral commitments bound themselves to the reduction of greenhouse-gas emissions by 20 percent by 2020, from the emission levels of 1990. The binding target for RES –E was set at the level of 20 percent for overall energy mix by 2020. (New EU energy package, 2007)

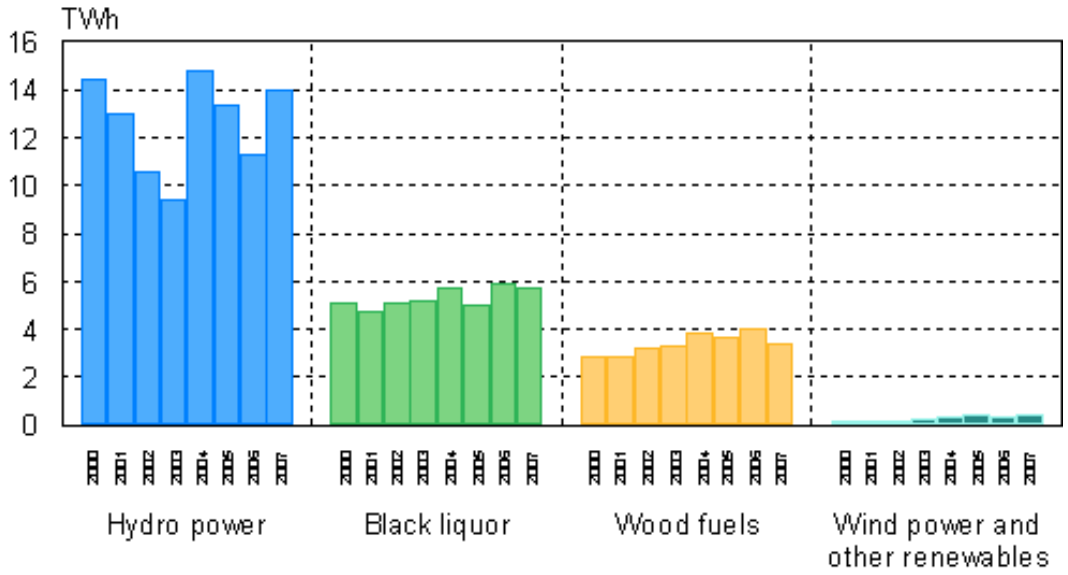
Consequently, Finnish government corrected its national electricity policy and RES targets in its annual Long-term Climate and Energy Strategy report 2008**.** In the report as of 6 November 2008 Finish government states that "…without any new measures, in 2020 Finland's greenhouse gas emissions would exceed those of 1990 by approximately 20 percent, almost entirely due to emissions from energy production and industry. According to the Commission's proposal, Finland should, by means of national measures, cut emissions from other sectors, such as transport, house-specific heating and agriculture, by an average of 16 percent from the 2005 level, by 2020." In order to balance the situation the government sets two goals such as the increase in the share of renewable energy to 38 percent by 2020 and cuts in the final energy consumptions. (The Government aims at decreased energy consumption and intense growth in the share of renewable energy sources, 2008)

The better option could be support of renewable energy sources from their initial stage in the country's energy portfolio. Would it be the better option for the Finnish government to introduce more incentives for the development of other forms of renewable energy than biofuels? Wind power and other renewables constitute only 2 percent from the whole amount of renewable electricity. This figure is astonishingly small in comparison to the energy source data of Finnish neighbors.

Statistics for the last seven years shows that level of renewables in Finnish energy portfolio is high only due hydro power and bio fuel received from wood derivatives.

According to the data provided by Statistics of Finland, in the 2000s about a half of all RES energy came from hydro sources.

Figure 3
Production of electricity with renewable energy sources 2000-2007.



Source: Production of electricity and heat in 2007, Statistics Finland 2008

Nordic region traditionally regards hydro power as its main renewable electricity source, which provides electricity at a rather low production cost. Unfortunately, in Finland this type of energy has no high potential for development as most of the possibilities for growth have been already used. This source of energy is also dependable on the favorable water supply during the year, which reduces its reliability for energy producers.

Wood is highly used for electricity and heat generation in Finland. There may be a drop in the supply of wood fuels, if there is a slow down in production in the wood and paper in industry. Low possibility for transportation of wood fuels from the place of their production to plants also makes them less economic profitable. “In 2007, electricity produced with black liquor from the forest industry accounted for 24 percent of the

electricity produced with renewable energy sources and that produced with other wood fuels for 14 percent." (Finland Statistics, 2008)

4.1. Biofuel energy

To maintain biofuels competitiveness in power generation, a tax subsidy was introduced in 1997, when fuel taxes were replaced by taxes on electricity consumption. Production and utilization of renewable energy have been promoted for a long time by providing funds for research and development and by introducing financial and fiscal measures. (Energy taxation of fossil fuels and grants for investments) Bioenergy accounts for about of 20 percent of electricity demand. It is one of the highest rates of bioenergy use among developed countries and there are expectations that it is going to rise by 35 percent over the next ten years.

Bioenergy accounts for about 85 percent of renewable energy production in Finland. Biomass is traditionally coming from residues from the chemical and mechanical forest industry. Nowadays, companies use perennial energy crops, forest chips from logging residues, and biodegradable fractions of recycled waste. The pulp and paper industry provide over two fifths of biofuels used for electricity production. Use of peat is receiving special attention from the government and this type of energy and electricity source accounts for about 6 percent in the country energy portfolio.

Biofuels posses a great advantage, as they are one of the main ways to greenhouse gas reduction. They do not represent the cheapest variant of electricity production but, in comparison to nuclear energy, they are much safer.

At the same time, the author would like to point out that the use of bioenergy does not always lead to no-greenhouse gas electricity production. Utilization of peat in electricity production is an example of environmental damaging. CO_2 emissions in this case are very

high due to the peat characteristics. Burning of wood residues is also one of the main sources of CO_2 emissions.

Another reason to be careful with bioenergy is the fact that already now there is a difference in opinions about its use. Bioenergy crops now take the land that was previously used for harvesting food products. This leads to the lack of land and increase of food prices. This negative effect hits in the first place people with low income. It does not help to improve life of the society.

Finland has not met this situation yet and the government is planning to increase the use of bioenergy. Quite soon, people may face the fact that some of agriculture products will become more expensive.

4.2. Hydro energy

“Hydropower is the most important renewable source of energy in the Nordic energy system. There are 207 hydropower plants in Finland. The annual output of hydropower in Finland is approximately 3,000 MWh, which equals 13 TWh of electricity generation. The total Finnish hydro potential is 2,130 MW. The full utilization of hydro potential is restricted mainly on the grounds of nature conservation.” (Hydropower in Finland, 2008)

In the course of preparing the National Climate and Energy Strategy, the Ministry of Trade and Industry ordered a number of evaluations. “One of them deals with the potential to increase mini-hydropower production and covers mainly the installed power less than 1 MW per plant. According to the evaluation results, the mini-hydropower potential located in environmentally non-protected areas has a mean-value of power 144 MW and an annual energy production 1021 GWh. Concerning the direct costs of energy, security, reliability and environmental externalities small- and mini-hydropower is the most competitive energy source. Despite this, it has often underestimated in many national and international

energy discussions. Although small hydropower has only a little influence on national level, it is of importance locally." (Energy and Enviro Finland, 2006)

4.3. Wind energy

"Generating electricity from the wind makes economic as well as environmental sense; the wind is a free, clean and renewable fuel, which will never run out. The wind energy industry - designing and making turbines, erecting and running them - is growing fast and is set to expand … the world looks for cleaner and more sustainable ways to generate electricity." (BWEA, 2007)

"The EU continues to be world's leader in total installed wind energy capacity, and one of the strongest regions for new development, with over 8.4 GW of new installed capacity in 2008. Industry statistics compiled by the European Wind Energy Association (EWEA) show that cumulative wind capacity increased by 15 percent to reach a level of 64,949 MW, up from 56,535 MW at the end of 2007. In the EU, wind power continues to be one of the most popular electricity generating technologies. As a result, renewable energy represented over 57 percent of all newly added power capacity in the EU in 2008." (Global Wind energy council, 2009a)

Electricity market is no longer a completely free market and various subsidies, taxation and feed-in tariff have a considerable effect on the electricity prices. Wind electricity generation comprises only operational and fixed costs as far as fuel (wind) is free. The cost of the wind electricity depends on the perspective taken by the investors. If they require early pay back on their money this would considerably increase the price level. If this project has the government support that guarantees a certain level of return to the investors then the development of wind farms has a bright future.

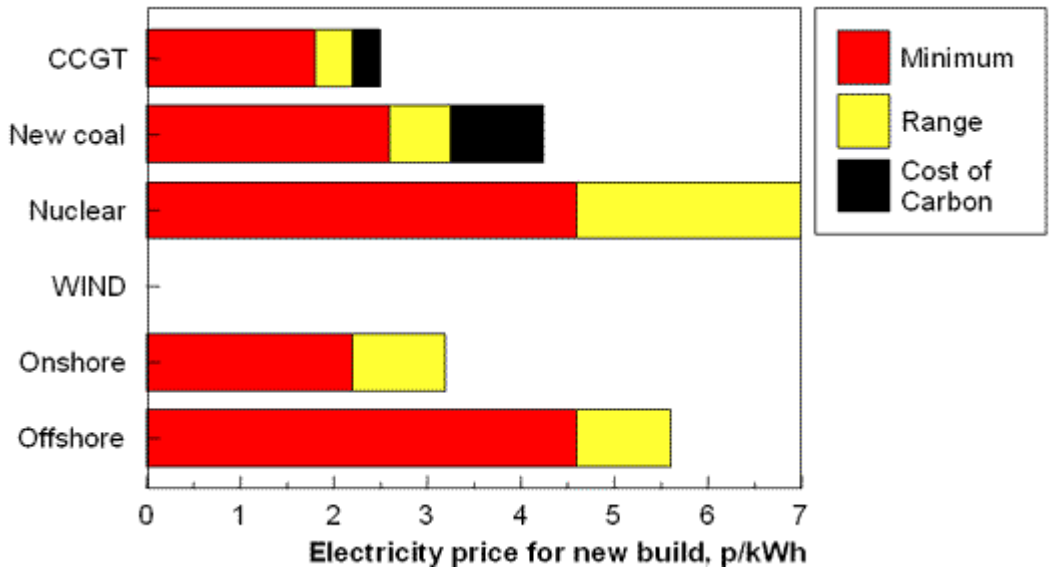
The price of the wind electricity is constantly falling down with the development of new technologies and practices. Wind electricity price varies from country to country but everywhere it keeps the tendency to drop. There is already a more than two times fall in

wind electricity price in the last ten years. Financing also becomes more affordable as lenders gain more confidence in the technology. Wind power should become even more competitive as the cost of using conventional energy technologies rises.

BWEA (2007) already states at its website that onshore wind energy is competitive with new coal fired plant, and cheaper than new nuclear power. The last aspect is quite interesting as nuclear power is often promoted as the cheapest option of CO2 free electricity.

“NB. The prices for fossil-fuelled generation used in the figure below have been drawn from recent government White Papers - except in the case of gas. To determine the true cost of generating electricity, the cost of pollution and other 'external costs' should be included in the calculations. External costs are the costs to human health and the environment, which are not reflected in the price of the electricity.” (BWEA, 2007)

Figure 4
Electricity price for new build, UK.



Sources: BWEA website, Reference, 2007

Finland is a part of the given political and economic unity but the dynamics of wind energy sector is a bit different. A lot more attention is given to the construction of nuclear plants as this is the path Finland has chosen for its energy policy. Finland does not sill have a feed in tariff (the 1st step in energy support) for wind energy and wind energy sector does not receive any considerable subsidies. The ones that exist are not sufficient and do not attract investors.

The government does not assist in the legal procedures concerning the land rent for wind farm. The author hopes that the fact that new Long-term Climate and Energy Strategy report 2008 includes governmental initiatives for wind energy development would boost the present growth. The long waited feed-in tariff for wind power is going to be introduced in 2010.

Finnish power Association provides the data, according to which, … "total installed wind power capacity in Finland is 143 MW, 118 wind turbines (December, 2008). Wind power production in 2008 was 260 GWh, which is about 0.3 percent of the Finnish electricity consumption." (The Finnish Wind Power Association, 2009)

"The feed-in tariff is expected to further the construction of wind power in line with the Government's Climate and Energy Strategy, whose objective it is to increase the production of wind power to 6 TWh, i.e. by almost 30 times by the year 2020 (current production level approximately 0.2 TWh)… the target price for wind electricity is set at €83.5/MWh. This price is rather high and the difference between it and the average market price (€40-50/Mwh) would be used as a feed-in tariff for wind electricity producers." (Working Group Proposes Market-based Guaranteed Price for Wind Power, 2009)

Analyzing the funding issues, the author concluded that the raise in price for the electricity end-users (the feed-in tariff is collected from them directly) would not be rather high. General proportion of wind energy among RES in Finland stays rather small but there is a steady increase from its side. Wind energy industry provided research to calculate the

benefit to the national economy received from the development of wind power technology in Finland.

“According to the calculations, investing a total of 220 million € for wind energy from 2006 to 2020 could result in raising the yearly wind technology exports from 200 million € to 1,400 million €/yr by 2020 and creating 18,000 new jobs. According to this scenario, total investment for wind power in Finland would be 100 million €/yr on average from 2006 to 2020 (1,500 MW), and this would result in a CO2 reduction of 7 million tons during those years (10 TWh total).” (IEA WIND ENERGY, Annual Report 2007)

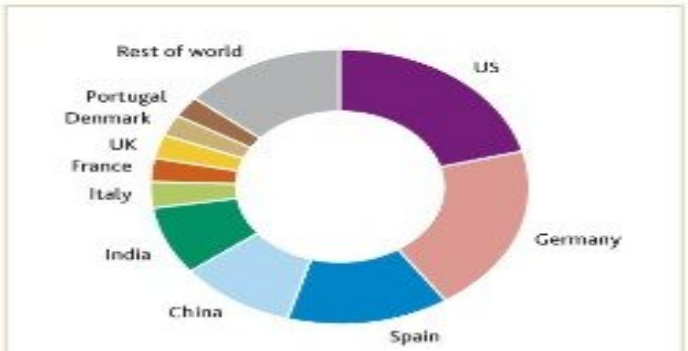
4.3.1. Wind electricity development - Germany

“From an emerging fuel source twenty years ago, wind energy has been transformed into a mature and booming global business. Generation costs have fallen dramatically over the last 15 years, moving closer to the cost of conventional energy sources. Modern wind turbines have improved dramatically in their power rating, efficiency, and reliability.” (Global Wind Energy Council, 2009b)

Germany is holding the top position in wind energy production in European area in terms of total installed capacity and in terms of new installations, even though it is not the world leader. “Total installed wind power in Germany exceeded 22 GW in 2007. During 2008, 866 new wind turbines with a capacity of 1,665 MW were installed in Germany, bringing the total up to 23,903 MW.” (Wind Energy Report, 2008)

It is very hard to explain what wind energy means for the German economy since this kind of renewable energy generated 40.4 TWh of electricity in Germany in 2008, representing 7.5 percent of Germany’s net electricity consumption. It has to be admitted that this figure is constantly growing. Financial uncertainty in the world and high political risks stimulate Germany to invest lots of money into renewable sources of energy. As a result, country demonstrates a good pace in the wind energy production and promotion.

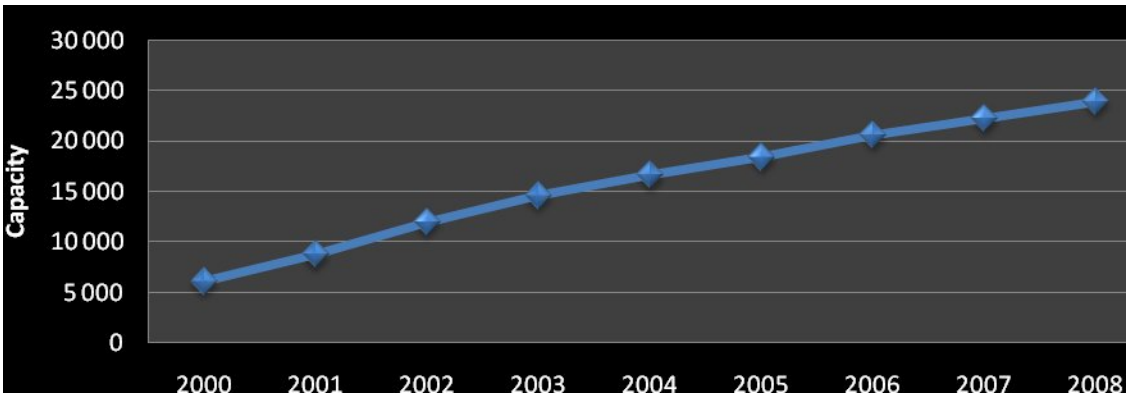
Figure 5
Top 10 total installed capacity 2008.



	MW	%
USA	25,170	20.8
Germany	23,903	19.8
Spain	16,754	13.9
China	12,210	10.1
India	9,645	8.0
Italy	3,736	3.1
France	3,404	2.8
UK	3,241	2.7
Denmark	3,180	2.6
Portugal	2,862	2.4
Rest of world	16,693	13.8
Total top 10	**104,104**	**86.2**
World total	**120,798**	**100.0**

Source: Wind Energy Report, 2008

Figure 6
Total installed capacity of wind energy in Germany.



Source: Wind Energy Report, 2008

Feed-in law for wind-generated electricity has existed in Germany since 1991. The Renewable Energy Sources Act (Erneuerbare-Energien-Gesetz-EEG) came into force in 2000 and still provides the main stimulus for the German wind market. Under the EEG, electricity produced from renewable energy sources is given priority for grid connection, grid access in both distribution and transmission grids, and power dispatch.

"Germany's Electricity Feed-In Law, enacted in 1991, changed the market conditions for renewable electricity producers by obligating utilities to buy renewable electricity and by dictating the price that renewable electricity producers would receive for their power. Utilities were required to buy renewable power at 90 percent of the retail rate for electricity. This law did two important things for renewable electricity producers in Germany. First, it created a market for renewable electricity. Second, it guaranteed producers of renewable electricity a sustainable price high enough to cover their long-term costs. Both of these factors combined to make renewable electric generating capacity a better investment." (Policies to Promote Non-hydro Renewable Energy in the United States and Selected Countries, 2005)

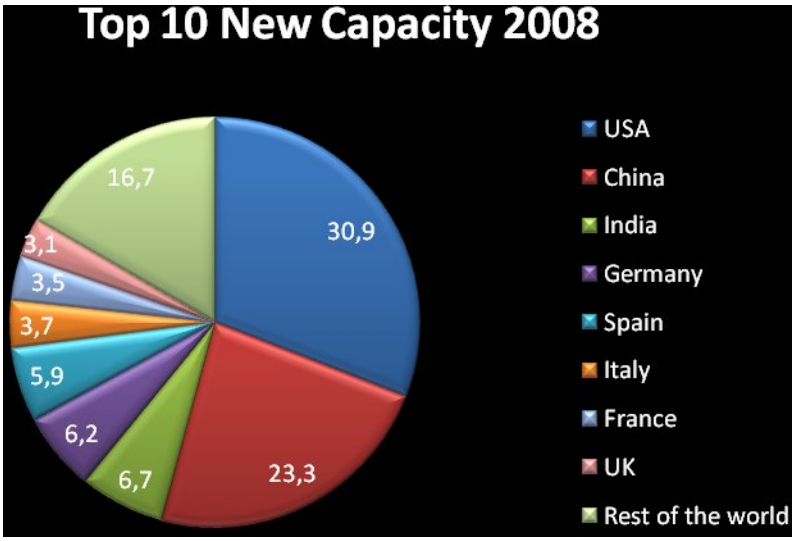
Wind energy in Germany is a good example of a success story. Thanks to a reliable domestic market, German manufacturers and suppliers are leading the way in developing wind energy worldwide. According to the new Renewable Energy Directive of the European Union, which will come into force in the summer of 2009, Germany has an overall target of producing 18 percent of its final energy consumption from renewable energy sources.

"Manufacturer survey conducted by German Wind Energy Association (BWE) and the Association of German Machinery and Plant Manufacturers (VDMA) underlines the importance of a stable domestic market as the basis for success in the continually growing international market. In the first half-year of 2008, 415 wind turbines with a total capacity of almost 800 megawatts were installed in Germany – around 20 percent more than in the same period last year. Thus, a total of 19,869 wind turbines with an overall capacity of

23,044 MW were installed in Germany by the middle of 2008." (Global Wind Energy Council, 2009b)

Having a look at the current trends in the German wind energy, one can see that country is trying to concentrate on the developing existing energy power units than building the new ones. Repowering which means replacing old turbines with new or bigger ones will play a stronger role in Germany in the future.

Figure 7
Top 10. New capacities 2008.



Source: Global Wind Energy Council, 2009

4.3.2. Wind electricity development - The Netherlands

The Netherlands enthusiastically develop renewable energy sources. … "renewable energy sources have increased significantly since 1990 and they account for only 3 percent of energy supply (below EU-27 average of 6 percent). The Dutch policy goal is to achieve a share of 17 percent renewable electricity in the domestic demand in 2020, corresponding to 18–24 TWh." (Science direct, 2009)

Due to the beneficial geographical position, the Netherlands has a great potential to produce effectively both on- and offshore wind energy. "The new installed wind capacity in the Netherlands in 2007 was 209 MW. Wind power generated 3.4 TWh of electricity or 2.9 percent of the total electricity consumption of 117 TWh. The Netherlands government doubled its ambition from 10 percent to 20 percent renewable energy in 2020. Capacity of Offshore Wind Energy should be 678 MW by the year 2014." (Wind service Holland, 2009)

Table 2
Key Wind energy Statistics for the Netherlands in 2007.

Total installed wind generation	1,745 MW
New wind generation installed	209 MW
Total electrical output from wind	3.4 TWh
Wind generation as percent of nat. electric demand	2.9 %
Target:	9 % Renewable Electricity in 2010

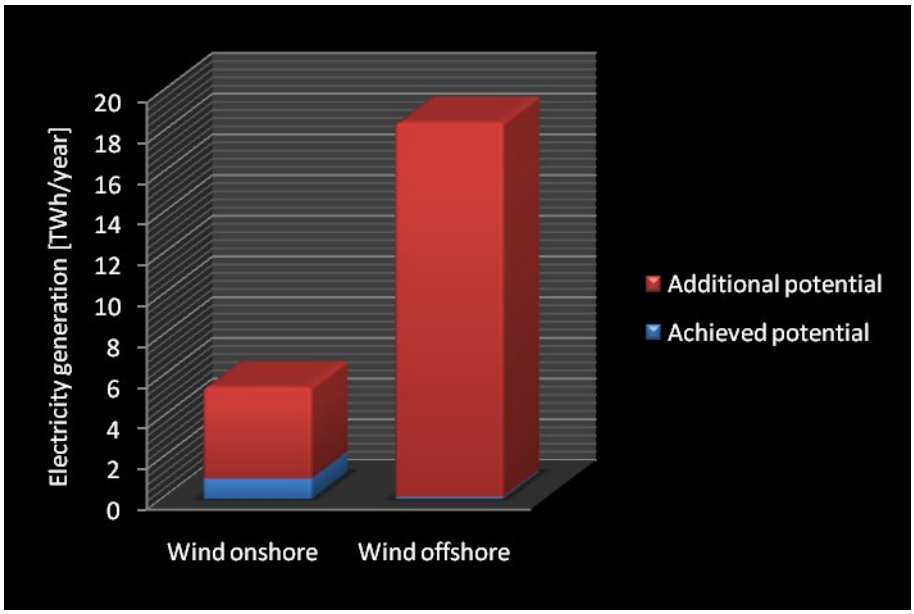
Source: Wind energy report, 2008

"Total investment in wind energy installations in the Netherlands for 2007 can be estimated at 230 million €, assuming an average investment cost for land-based wind of 1,100 €/ kW for the 209 MW installed. The total investments in wind energy installations

from 1989 to 2007, not corrected for inflation, are estimated to be at some 2,200 million €. The Netherlands has a very great potential to develop offshore wind industry in the future." (IEA WIND ENERGY Annual Report 2007 Global, 2008)

Despite the fact that the Netherlands is not even in the first five top producers of wind energy, the Dutch government has very ambitious plans. Until 2011, the government expects the growth of renewable energy to come mainly from wind energy.

Figure 8
Mid-term potential of wind energy in the Netherlands.



Source: Commission of the European Communities, 2004

Table 3
Wind capacity for 1,000 inhabitants in the European Countries in 2008 (kW/1,000 inhab.).

Denmark	580,7
Spain	369,7
Germany	290,7
Portugal	269,6
Ireland	227,8
The Netherlands	135,6

Source: Eurobserver, 2009

4.3.3. Comparison of Wind energy development in Germany, the Netherlands and Finland

Finland, Germany and the Netherlands are representing different examples of how countries may develop various wind energy strategies. Germany and the Netherlands were the first countries to understand the potential of the offshore wind energy. In the recent past, Finland was considered as a relevantly new country in the wind energy business, but, nowadays, it may become one the most developing economies.

Table 4
Key indicators for Germany, Finland and the Netherlands.

Key Indicators	**Netherlands**	**Germany**	**Finland**
Population (million)	16.34	82.37	5.27
Energy Production (Mtoe)	60.77	136.76	18.05
Electricity Consumption (TWh)	115.32	590.98	90.46
Net Imports (Mtoe)	36.82	215.56	20.54
Electricity Consumption / Population (kWh/capita)	7057	7175	17178

Source: International energy agency, 2009

The following table presents the growth of wind industry in Finland, the Netherlands, and Germany. Despite the lack of governmental support, Finland demonstrates a high level of growth in the last three years.

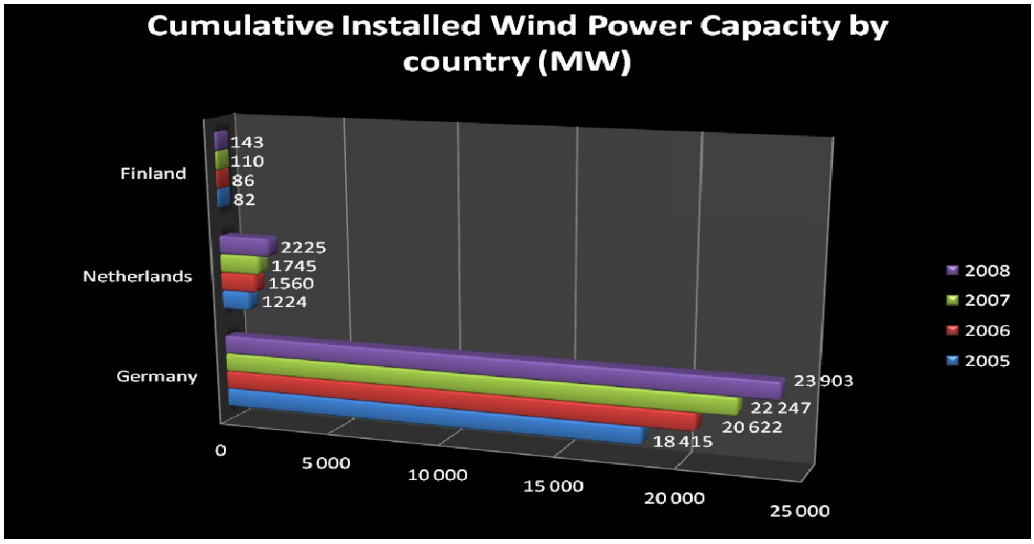
Table 5
Total accumulated wind energy capacity 2005-2008.

Country	2005	2006	2007	2008	Growth 2005-2008
Germany	18,415	20,622	22,247	23,903	29.80 %
Netherlands	1224	1560	1745	2225	81.70%
Finland	82	86	110	143	74%

Source: International energy agency reports, 2009

International Energy Agency report 2008 claims that Germany is the European leader in wind energy production during the last 15 years. The Netherlands is now regarded as the 7th European wind energy producer. Its position was better in the period 1993-1999. That period the Netherlands had several governmental support programs for wind energy.

Figure 9
Cumulative Installed Wind Power Capacity by country (MW) 2005-2008.

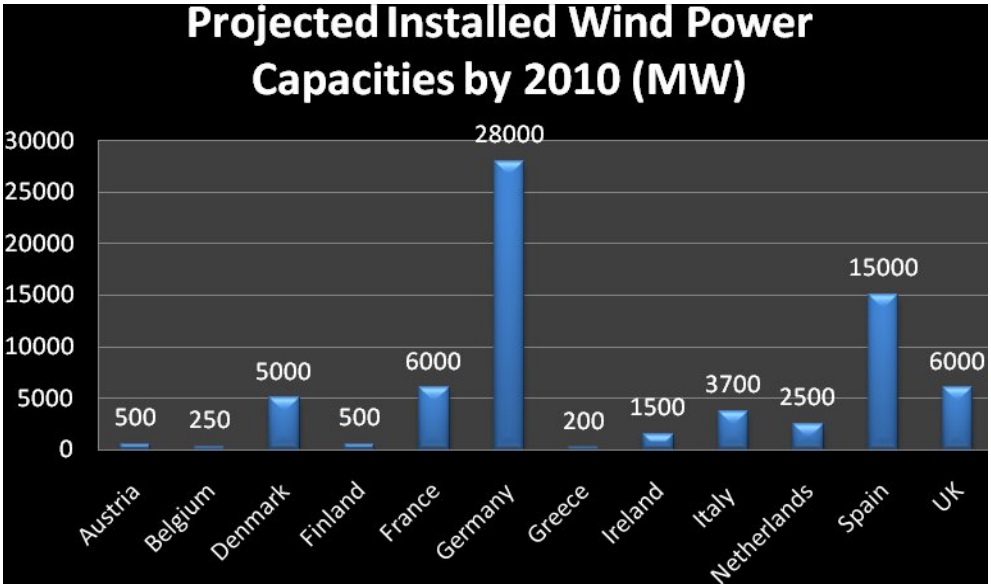


Source: International energy agency reports 2005-2008

Only in 2004, Finland reached the first 10 wind energy producers. In 90s Finland did not have any substantial wind energy promotional programs and this may explain its slow growth in the given period. Though nowadays the growth rate is very high it has a long way to go before Finland may reach the leaders.

Aidan Cronin, International Policy Advisor at Vestas Wind Systems, in his work "Wind a European Success Story," presented projected installed wind power capacities by 2010 in the European countries. In that figure, one may see that Finland is expected to make almost 400 percent growth for the next two years, while Germany has only 17 percent and the Netherlands 12 percent.

Figure 10
Projected Installed Wind Power Capacities by 2010 (MW).



Source: Cronin A., 2008

Figures of public RES R&D budgets of Finland and the Netherlands say that governments of these countries are willing to spend considerable amounts of public money on R&D related renewable energy resources and, particularly, to wind energy, because they assume

that wind may become an important energy source. As a reflection, the countries are leading in terms of growth rate in installed new capacities. Unfortunately, this was not always the case for Finland. Only recently Finland has invested more than 100 mln $ for the period 2004-2006 and it is expected that the electricity from the renewable sources will take more space in the total electricity consumption.

Table 6
Public RES RD&D budgets (mln.$) in 2001-2006.

Country	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**
Netherlands	87.39	63.2	43.27	-	50.71	56.64
Finland	35.85	37.93	17.47	40.85	34.11	32.94
Germany	34.59	22.41	24.55	29.04	25.86	28.86

Source: International energy agency, 2009

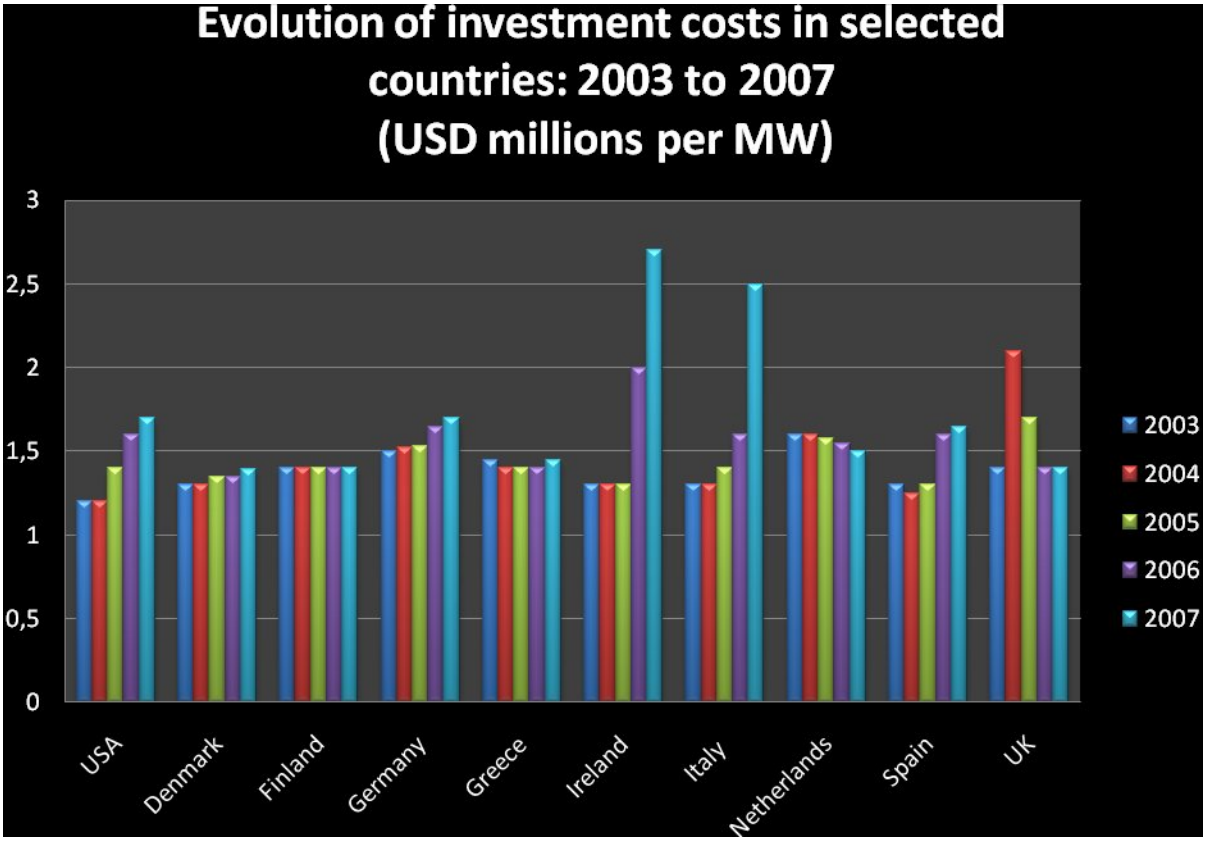
Analysing latest public R&D budgets of Germany, Finland and the Netherlands, the author can conclude that all countries are showing strong interest in development of wind energy sector. This conclusion is made on the assumption that public R&D expenditures may be used as a key indicator for the willingness of countries to increase the share of wind energy in their energy use.

Because of the big R&D spending, Netherlands is the third largest in offshore installed capacity in 2007 (130 MW) and ahead are only Denmark (420 MW) and the United Kingdom (300 MW). (Renewable Energy Essentials: Wind, 2009)

Another interesting indicator, which could be used to compare and contrast Finland, Germany and the Netherlands, is investment cost (mln USD per MW) for the wind energy

installed capacities. This indicator demonstrates the start-up costs. On the figure below, the readers may see that investment costs are increasing in Germany for the period 2003-2007.

Figure 11
Evolution of investment costs in selected countries: 2003 to 2007.



Source 16: IEA- Renewable energy essentials, 2008.

Since 2004, turbine costs have been risen by around 20-80 percent (2006), driven by supply tightness (turbines, gear boxes, blades, bearings and towers) and higher commodity prices (particularly steel and copper). Industry sources expect supply tightness to loosen by 2010. In 2007, onshore turbine costs were USD 1.6 mln. per MW in Germany and USD 1.5 mln in the Netherlands.

Investment costs in the Netherlands, for the period 2003-2007, went down from 1.55 to 1.5 mln. € per MW. Drivers for cost reductions include increased performance and reliability,

technology advances, larger turbines (when installed offshore), and increased manufacturing capacity. Investment costs in Finland for the mentioned period remained at the same level.

Next indicator is a number off- & on- shore projects going on in Finland, Germany and the Netherlands. In this category, Germany is the leader and the expected output of these projects is more than 500 MW. The Netherlands has almost half of the German projected capacities but all of them are operational. Finland has slightly low amount of projected capacities.

General conclusion could be made that Germany is the European leader and keeps its position, though thee is a slow down in its development. It heavily promotes wind energy in the direct and indirect ways. Finland is catching up with the European leaders but has a long way to go. Only recently, the government has started to provide sufficient R&D funds but indirect support provided is still insufficient. The companies are developing wind energy projects on their own green initiative. There are high expectations that the next several years will be a breakthrough to the Finnish wind energy sector. The Netherlands used to be among the leaders and now attempts to return its former position.

5.0. RES promotion and marketing

RES promotion could be divided into two categories: direct and indirect. Report *Promotion strategies for electricity from renewable energy sources in EU countries* (2001) provides a classification of the existing promotional strategies for RES.

The government may also decide on the share of RES in its electricity portfolio and support their development by tendering/bidding, quotas, Renewable Portfolio Standards and Obligations. Environmental pricing RES can also be promoted by means of indirect strategies, for example CO_2 taxes or removal of subsidies given to fossil and nuclear generation. Table 7 gives the lay-out of these methods.

Table 7
Fundamental types of strategies.

		Direct		Indirect
		Price-driven	Capacity-driven	
Regulatory	Investment focussed	• Rebates • Tax incentives	• Quotas (RPS) / TGC • Bidding	• Environmental taxes
	Generation based	• Feed-in tariffs • Rate-based incentives		
Voluntary	Investment focussed	• Shareholder programmes • Contribution programmes		• Voluntary agreements
	Generation based	• Green tariffs		

Source: Haas, Reinhard (ed.), 2001

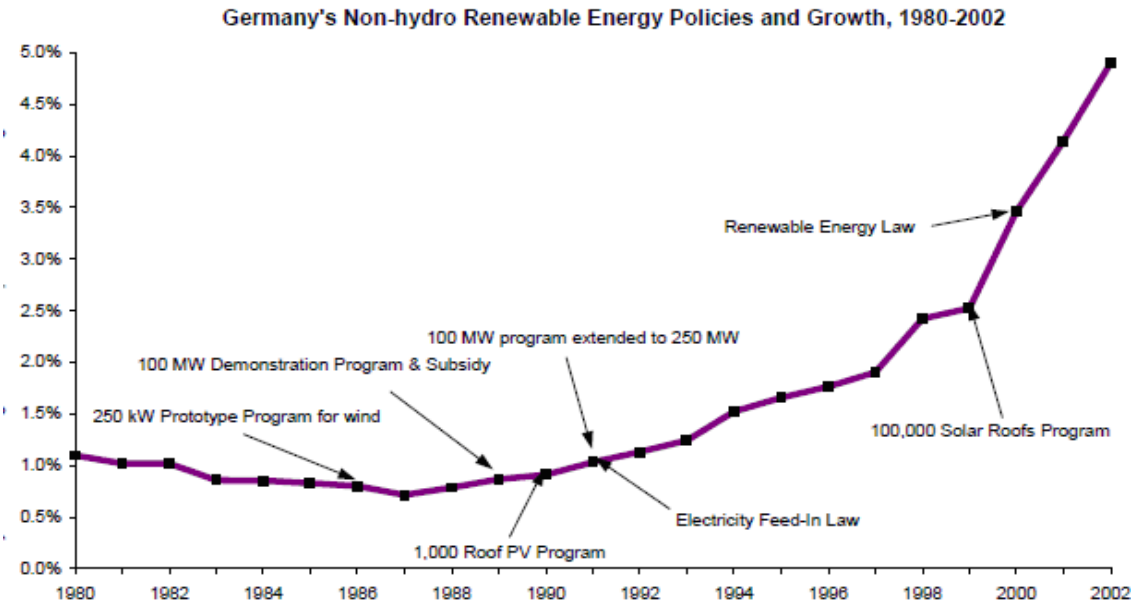
Regulatory strategy was and still remains the main booster for green energy development and promotion. The author had the possibility to compare wind energy development in Germany, Finland and the Netherlands. The situation with present development of these countries becomes clear after the analysis of their promotional strategies. Until recently Finland was giving only basic promotion support to wind energy sector.

“Finland has taken the following measures to encourage use of RES-E:
o *Tax subsidies:* RES-E has been made exempt from the energy tax paid by end users.
o *Discretionary investment subsidies*: New investments are eligible for subsidies up to 30% (40% for wind).
o *Guaranteed access to the grid* for all electricity users and electricity-producing plants, including RES-E generators (Electricity Market Act – 386/1995).
Biofuels benefit from tax exemptions under certain conditions.” (FINLAND – Renewable Energy Fact Sheet, 2007)

Recent changes in Finnish energy policy and the expected introduction of feed-in-tariff are going to have a huge effect on the development of this energy source in Finland.

The figure below gives a full description of the actions taken by Germany during the last several years.

Figure 12
Germany's Non-hydro Renewable Energy Policies and Growth, 1980-2002.

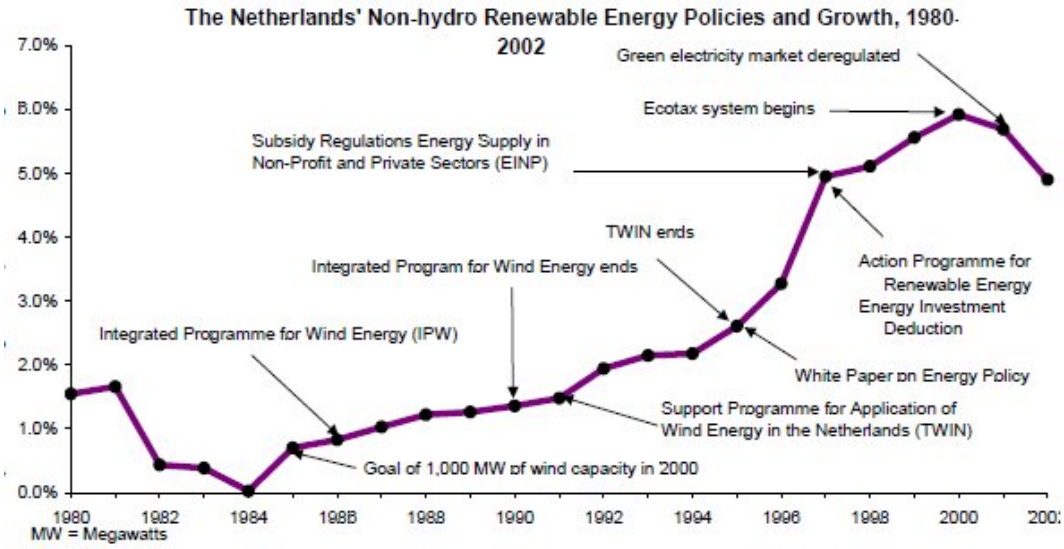


Source: (Policies to Promote Non-hydro Renewable Energy in the United States and Selected Countries, 2005)

One may see that the main achievements Germany and the Netherlands (Figure 13.) had during the periods of active government intrusion into wind energy sphere. Germany was among the first to introduce feed-in-tariff to promote RES. "In 2000 it also passed the Renewable Energy Law, which set specific prices that independent renewable power producers could receive for each type of renewable energy source, although for a limited amount of time. For instance, in 2000, a new wind turbine project would be paid 0.178 DM per kWh for the first 5 years and then the rate would begin to fall. The decreasing nature of the prices is reflective of Germany's expectation that these projects would become

increasingly cost-competitive." (Policies to Promote Non-hydro Renewable Energy in the United States and Selected Countries, 2005)

Figure 13
The Netherlands' Non-hydro Renewable Energy Policies and Growth, 1980-2002.



Source: (Policies to Promote Non-hydro Renewable Energy in the United States and Selected Countries, 2005)

The Netherlands' top performance happens during the time of governmental active promotional campaigns and programs for wind energy. There was a constant growth before deregulation of green energy market. The fact that it provoked decline may be assessed as a partial failure of this action as the same procedure in Germany and Finland did not give such a negative effect.

After the process of deregulation at the electricity market, consumers received the possibility to choose themselves their electricity provider. This refers not only to city municipalities or small and big companies but to residential consumers as well. This situation brings competition to the electricity market and makes the companies to take the initiative and find the way to attract new customers.

In the next part of this section the author is going to concentrate her studies on the examples of green energy marketing from the USA and the UK, where this sphere received a lot of attention. The possibility of applying these techniques to Finnish energy market is studied as well.

Finnish energy companies are world –known for RES development and hold many EU awards in the field of green power R&D. In Finland great efforts are given to the development of green electricity technologies and production cycle but no enough attention is provided to the sales and marketing sides.

Companies receive recognition and good brand awareness for “going green”. Their efforts for deployment of green energy R&D and supply of renewable energy to the market bring them government and public support. In the USA, there are several national awards for promotion and supply of renewable energy. US Department of Energy provides Green Power Leadership Awards on an annual basis. Department of Energy recognizes green power suppliers in three categories:

“New Green Power Program or Product: This award recognizes green power programs or products judged as "most successful" in the marketplace based on both customer participation and green power sales.

Renewable Energy Marketer: This award recognizes renewable energy project developers or technology vendors.

Green Power Program of the Year: This award recognizes exemplary green power programs” (Green Power Suppliers: Marketing Renewable Energy to the Masses, 2007)

Finland may go the same way. There may be created several public events and programs to support green companies.

The author would like to point out that the phrase “customer participation” is used quite often in the above paragraphs. Unfortunately, it is not the case with the Finnish market,

where customer participation in the enlargement of renewable energy share of the electricity market is rather low.

In order to increase involvement level and put a customer in the decision making position regarding RES energy purchase the potential customers should be initially educated about RES. Campaign success depends on integration of educational steps into a particularly targeted marketing program. American companies spend huge financial resources for these steps and regard them as long term investments.

RES energy should be clearly differentiated in the consumers' minds and attached to emotional values. They are some of the main reasons why the customer is ready to pay a premium for green electricity. Social pressure, altruism and moral satisfaction are the main drivers for green energy purchase.

Green marketers should use consumer segmentation and frame customers' thinking using a range of initiatives to appeal to varying consumer commitment levels. Understanding of consumer characteristics at the green market would help to better design a marketing campaign, addressing particular needs of customers and minimizing premium cost effects. Green marketers should emphasize the tangible benefits of green products using proven consumer-focused marketing techniques.

5.1. Direct marketing

Print communications could be a good option for brining awareness about your products. There could be several months of direct mail campaigns (brochures, banners, postcards, posters) so popular in Finland with its good paper industry. Educational postcards could not be only send to home addresses of potential customers but may as well be placed in some public places. Door to door marketing proved to be a successful method to reach potential new customers in England. UK energy companies receive positive feedback that most people find direct sales informative and effective.

Unfortunately, some of the customers had negative experience as some fraud cases took place. In order to avoid this, the procedure was specially regulated and licensed by the law. Certain countries also introduced special marketing legislation in order to protect the public from receiving unsolicited visits or telephone calls from energy providers.

An educational campaign in cooperation with some fast food chain that buys from you green energy could be a success. It would show its environmental commitment and tell about your company to potential customers.

5.2. Eco –Trademarks and green certificates

Green certificate systems are well established in the USA and in Europe. Finnish market also established eco-energy trademarks such as Norppa green certification, Hyötysähkö (Efficient power), Hyötytuuli (Efficient wind), and Ekosähkö (Eco-electricity).

Norppa green certification is promoted by the Finnish Association for Nature Conservation. It sets the condition that electricity should be received from renewable energy sources and the company is subject to special reporting. Norppa electricity has a special premium to be paid by consumers. According to the author's research, nowadays, around 26 companies are using "Norppa recommends eco-energy" label.

Unfortunately, though these certificates are widely promoted their market share is rather small. There are no substantial incentives to make the electricity sellers to buy these certificates. They are acquired mainly on the customers' own initiative. The majority of small- scale customers come from resident sector.

5.3. Membership card program

The cooperation of producers and green energy buyers agree to a certain membership card system that allows getting bonuses through visits to the businesses (cafés, fuel stations…)

that use green energy from a certain supplier. In Finland this type of marketing program is still not presented.

5.4. Web marketing

In the first place RES energy promotion starts from the company's web site. Only 100 percent green electricity oriented Finnish companies use this tool. Companies that have mixed energy portfolio use it in a very limited way.

Good examples of active web marketing could be American companies such as Sterling planet (http://www.sterlingplanet.com) or 3Degrees (http://www.3degreesinc.com/). One may see efforts to make the consumer to choose green electricity on their web sites. This way visiting web site of Sterling planet every American can see how he may make a difference to his state by choosing green energy from this supplier.

One more way to educate the customer and promote green energy is the presence of carbon calculator. Different types of Green energy calculators can be easily found on the web pages of such companies as E.ON US (http://www.eon-us.com/green/). With its help, the potential or present customer is able to measure his direct and indirect greenhouse gas emissions and see how his lifestyle compares to national averages or average energy consumption particularly in his state.

"Once you've determined your carbon footprint (direct and indirect greenhouse gas emissions), you will be able to purchase clean, renewable energy to offset your electricity use. In addition, you will have the opportunity to purchase carbon offsets to offset the environmental impact of your driving, flying, natural gas and fuel oil use."
(Sterling planet, 2009)

At the web sites of Finnish electricity companies renewable energy is mentioned only with reference to social responsibility and is not usually presented in the web site sections

dealing with energy sales. There is practically no active involvement of mass electricity consumers into green energy sales. Sales of green energy happen only due to the initial interest of the buyer and not because RES energy was promoted to him.

The only exception to name is Fortum where the consumers may find Fortum Tarkka and Fortum Kesto. These programs could be named pioneer steps in Finnish marketing of renewable energy. There is still a long way to go to implement all possible marketing techniques.

Web advertising could also be widely used to bring mass awareness. Web 2.0 brings unlimited opportunities to involve the potential customers into taking care of the greenhouse gas emissions. You should send accurate and simple message that tells your story.

5.6. Voluntary programs organized by energy producers

Voluntary programs still have not found wide use in Finland. The example below shows Blue Sky, the voluntary program of Pacific Power company (US low-cost electricity producer), which is self-funded by participating customers. “Funds received from participating customers are used to purchase renewable energy credits, to cover customer education, community outreach and program administration. If additional funds are available, we reinvest them into small-scale renewable energy projects to help advance a better understanding and development of renewable energy technology. In 2008, we invested approximately $1.5 million in 32 renewable energy projects throughout our company’s six-state service area using Blue Sky funds.” (Blue Sky Community-Based Renewable Energy Projects, 2009)

Another successful marketing approach is the creation of Clean Energy Fund. This practice is widely used in the US. Connecticut has developed a special voluntary clean energy

Communities Program. The result of its work is already impressive. The program consists of five –step process:

1. Establish an ambitious target for communities (20 percent clean energy by 2010)
2. Identify a voluntary action for consumers to take (sign-up to purchase green electricity through CTCleanEnergyOptions).
3. Implement a widespread messaging campaign.
4. Encourage and recognize voluntary action by rewarding participating communities with visible solar photovoltaic systems on public buildings.
5. Use an independent monitoring and evaluation contractor to track voluntary actions and progress towards goals.
(Clean energy states alliance, 2009)

The author believes that the given practices could have a very positive answer in Finland. "According to the data provided by Taloustutkimus Oy in the autumn 2001, 46 percent of the Finnish consumers expressed willingness to buy green electricity even if it were 4 eurocents/kWh more expensive than conventional electricity. However, the actual buying behavior has not supported this result. Since that time the situation did not have any considerable changes. There is a lot of unrealized potential for marketing of green energy in Finland." (Lumijärvi, Otterström and Hämekoski, 2003) In the conclusion the author may say that the present situation represents a considerable challenge but also a considerable opportunity for Finnish electricity retailers.

6.0. Future picture of Finnish energy sector

The question of future development of Finnish energy sector receives a lot of attention and its prognosis is updated every year. In 2003, VTT Technical Research Centre of Finland presented several future energy scenarios and one of them became reality after presentation of Long-term Climate and Energy Strategy report in year 2008**.** It is the "Save" scenario,

where greenhouse gas emissions must be reduced by 20 percent from the 1990 level by 2030. It includes extensive measures and incentives to reduce energy consumption. Special attention is paid to the paper industry as the most energy taking in Finland.

The main aim of the VTT analysis was to study the potential future of energy sector and the abatement of green house gas emissions. The assumptions used in the scenario are related to the linkages between energy use and the environment. Global warming is presumed to be a reality, and consequently average annual temperatures are expected to rise in Finland by about 2 ºC by 2030. The targets of Kyoto protocol (1997) are used as guidelines for CO_2 emissions reduction. Other assumptions include general demographic and economic development, technology change as well as the raise in prices of fossil fuels. (Energy Visions 2030, 2003, p.193)

Due to environmental and fiscal reasons the energy markets are strongly affected by taxes and subsidies on fuels. Finland has already used high electricity taxation as one of the instruments to control the electricity consumption. VTT expects a high raise of energy taxes in the future.

Economic growth is expected to slow down in the new and rather “expensive” environment. The scenario is based on the average annual growth of 2 € in total GDP over the time period 2000-2030. Still the recessive demand for energy would inherently diminish the market prospects for new production capacity employing capital-intensive new technologies. In addition, the development path for the volume and product mix of the paper industries is expected to be largely dependent on the price level of energy and is therefore heavily affected by high taxation. The burden of emission reductions is assumed to be eased by structural changes in the economy. (Energy Visions 2030, 2003, p.224)

CO_2 free energy is the best option to keep the economic development stable. It will allow increasing electricity production without increase of greenhouse gas emissions. Finland is investing in RES sources but still decided to go for nuclear energy. The author finds it to be a political decision as far as it is assumed to be a very quick way to get CO_2 free energy.

The Finnish parties neglect the fact that the construction of nuclear plant and operation processes would constantly conflict with green parties and be behind the schedule.

According to the BWEA data, present technologies already allow more economic construction and operation of wind turbines than building a new nuclear power plant to get the same amount of energy. The only difference is the rate of return if it is not supported by the government program to some degree. However, isn't it the government obligation to support the nation-benefiting projects even if they require additional support in the initial stage?

Finnish government claims that even extensive growth of RES in Finland is not able to cover up any substantial amount of energy demand. In the process if study of RES in Finland the author noticed that the major attention is given to bioenergy, which in potential is limited. This situation does not refer to the wind energy sector, which was not in the focus of government attention in comparison to bioenergy. Wind energy sector has all the potential to make a considerable change at the electricity market. So far, Finland is continuing to invest in RES but claims that at this stage it is more profitable to go for nuclear energy and plans to construct 2 additional nuclear plants.

The future picture of RES in Finland is constantly improving.
VTT research group came to a conclusion that after upgrading of the existing hydro power plants, the normal year production of large and medium-scale hydro-power is assumed to increase smoothly to 13.5 TWh in 2030. This estimate also includes the possibilities to increase power and production by adding some new turbines, and by modifying the water flow arrangements. Consequently, the total hydro power production can increase to about 14.4 TWh.

The estimates for potential market for wind power are based on assessments made by wind power experts at VTT Energy. Accordingly, the total potential at coastal and arctic sites is estimated to be about 1200 TWh or about 2.5 TWh by the year 2030. There is a difference

of opinions regarding the evolution of the costs of new wind power plants. (Energy Visions 2030, 2003, p.201)

The various bioenergy sources in Finland constitute a substantial potential for the future markets of renewable fuels. In the given scenario, several options are presented for increase of the utilization of wood biofuels. The result is the large increase in the utilization of bioenergy. Compared to the amount of 2000, the utilization would be almost doubled. Wind energy is expected to increase to at least 1 TWH in 2010.

7.0. Recommendations

Nowadays Finnish Nordpool represents a real marketplace where all laws of marketing should be applied. The author has developed a set of her recommendations, based on the studies of generally applicable energy promotion tools.

- Educate country population about RES energy options.
- Stimulate Finnish energy sellers to apply active marketing policy
- Provide governmental programs to promote RES
- Introduce public, government and industry awards for RES promotion leaders
- Use Web marketing to the full
- Encourage voluntary actions for RES promotion
- Implement direct marketing and membership cards
- Create proper incentives for green certification
- Foster wind energy sphere as a priority in RES development.

8.0. Conclusion

Finland has a very high potential in development of RES. Its economics and R&D are able to further foster RES electricity. The only question to remain is the way to go in RES development. During the latest decades, Finnish government was giving its full support to bioenergy promotion. This renewable source is rather profitable but has certain serious limitations. Unfortunately, the attention and support provided for wind energy promotion was not enough. Direct and indirect promotions of this type of RES were rather weak.

The new CO_2 obligations that the country accepted in 2008 may change the present situation considerably. Urgent need for CO_2 -free electricity may provoke skyrocket growth of wind energy in Finland. The author needs to make a point that it could be hindered by the construction of several nuclear plants. They may compete for investments as a nuclear power is relatively cheap and could provide quick return for investors. This is more difficult to organize with wind power but this strategy is more beneficial in the end.

Nowadays, Finnish RES are mainly represented by hydropower, bio energy and wind energy. Though energy suppliers usually have them in their energy portfolios, the information about it is not always completely presented to the customers. There is no active green electricity marketing taking place. The customers look for and buy green electricity on their own initiative. Numerous surveys have shown that high percent of population is ready to vote for green electricity by their purse. Unfortunately, the present level of participants is quite low. Finnish companies should not only invest in development of RES technologies but also in education and green energy promotion to general population of the country. There is a number of marketing techniques that could be very successful in Finland. Finnish people are ready to participate and the only thing required is the active position of the energy sellers. Customers should be educated and involved in energy sales. This situation represents is a big challenge and a big opportunity for Finnish energy suppliers.

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