Viability of a wind and wave energy platform

Irene Salinas
Agustin Mesa Lombardo
Jean-Philippe Santini
Patricia Zurano Perez

Global Business and Mechanicals Engineering

VIA UNIVERSITY COLLEGE

Patricia Zurano-Perez 206113
Irene Salinas 203955
Agustin Mesa Lombardo 206063
Jean-Philippe Santini 204005

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VIA University College
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Irene Salinas 203955
Agustin Mesa Lombardo 206063
Jean-Philippe Santini 204405
Patricia Zurano perez 206112

Supervisor: Uffe V.Poulsen and Peter G.Harboe

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Patricia Zurano-Perez 206113
Irene Salinas 203955
Agustin Mesa Lombardo 206063
Jean-Philippe Santini 204005

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Jean-Philippe Santini 204005

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ABSTRACT

In this project, will be made the feasibility of installing a platform at sea, where wind turbines and buoys will be included, the energy will be obtained on the coast of Hanstholm, Denmark, where it is believed it is one of the best places for installation due to high wind speed that occurs there. In the first part, the theory is included to take all the general ideas, In the second part, the choice of location and distribution of wind turbines and buoys, that will be 3 wind turbines and 6 buoys, and finally an economic study of all project costs will be made.

Introduction

The wind has been a source of energy used in many activities; economic production and transport from the golden age of Egypt. Following the oil crisis of 1973, people realized that it was necessary to study and implement other forms of energy such as wind and solar. Obtaining energy from wind turbines not noted for produce harmful gases such as carbon dioxide.

In 1997, it signed the Kyoto Protocol, which had how purpose, reducing CO2 emissions, and one of the ways to achieve this is by using renewable sources. It was then when the wind was becoming the protagonist in all the renewable energy, and consequently it has an experienced growth exponentially.

Wind technology has evolved, especially with the installation of turbines, wind on the surface, but not much has happened with the wind offshore. This is because the installation of offshore wind turbines requires sophisticated technology and has higher costs. But in recent years, there has been a major push in this offshore wind technology located offshore North Sea and the Baltic Sea, becoming the UK and Denmark in leading this area.

Wind power has evolved in recent years, gradually, as in Europe and elsewhere, and with it, all the processes of construction and installation, which has led to the development of offshore wind, is that have developed new building materials, new support structures for wind turbines and new methods for installation.

This project focuses on a basic idea, the possible installation of buoys and wind turbines offshore, finding the best locations for this wind farm. In order to assign the best areas to install had to check the status and wind and sea conditions in the specific location.

Project purpose

This Final Project has as its main objective of the feasibility study implementation of a wind farm offshore, buoys to capture energy waves in Denmark territorial waters. To carry out the analysis, firstly carried out a selection of study the site taking into account the Strategic Environmental and energy as well as wind energy waves.

Subsequently, there has been a suitable choice of the different wind turbine models available in the offshore wind industry and the different technology devices capture energy from waves. And finally, an economic study has been made of all Installation.

On the business part of our project the goal is to get an overall idea of the market of energy and renewable energy in the World, Europe and France, with its main actors (competitors), its trends and the demand of customer to define a valuable marketing plan.

Methodology

To analyze the feasibility of a marine platform generation offshore wind turbines and buoys previously It is known the state of the wind and wave energy.

So, It has made a study of the state of the technology offshore, performing exhaustive search information in order to know the factors to be taken into account in the development of a project to build a fleet of marine turbines.

Once it is identified all the information and factors to be taken present, it is raised the possible installation of these features in one place Denmark territory.

And finally, it is developed the economic feasibility study of the installing generation marine park. Exposed Salient findings of the Final Project that allows synthesize and get an idea of what is considered important.

Concerning the Business

- Knowing the market of Energy, Renewable Energy and Wave Energy, the aim of this task is to have an overall image of the situation of the market (threats and opportunities), to figure out what could be the best positioning for us. The model that we will use, consist on an analysis of the environment (macro and micro) to choose a specific segment of the market, to differ of our competitors. At the end of this task we will make a analysis of our findings, this analysis will help you for determine the business model of our company. This analysis will also be helpful for the mechanicals students because they should use the study market to create an innovative and different product.
- Competitors Analysis in order to make Benchmarking, find the positioning of competitors on the market and try to position our company.
- Creation and application of a questionnaire in order to know the demand of potentiel customer.
- Marketing Plan Template from the book “How to write a successful Business Model” by Stephen Lawrence and Frank Moyes from University of Colorado.

- Financial data, it is very important in order to know if the business is going to be profitable and if it could be continued on the time, in other words, see if the business is going to succeed.

Mechanical Part of the project

Augustin Mesa Lombardo 206063
Patricia Zurano Perez 206113

1. Wind energy

2.1. Offshore wind turbines

Any wind turbine consists of a set of elements that transform the kinetic energy of the wind into electrical energy and they are reaching different points of satisfying consumer needs that may exist in an area. The turbines can be located on the land or sea and are located in places where there are high wind speeds.

2.1.2. Parts of an offshore wind turbine

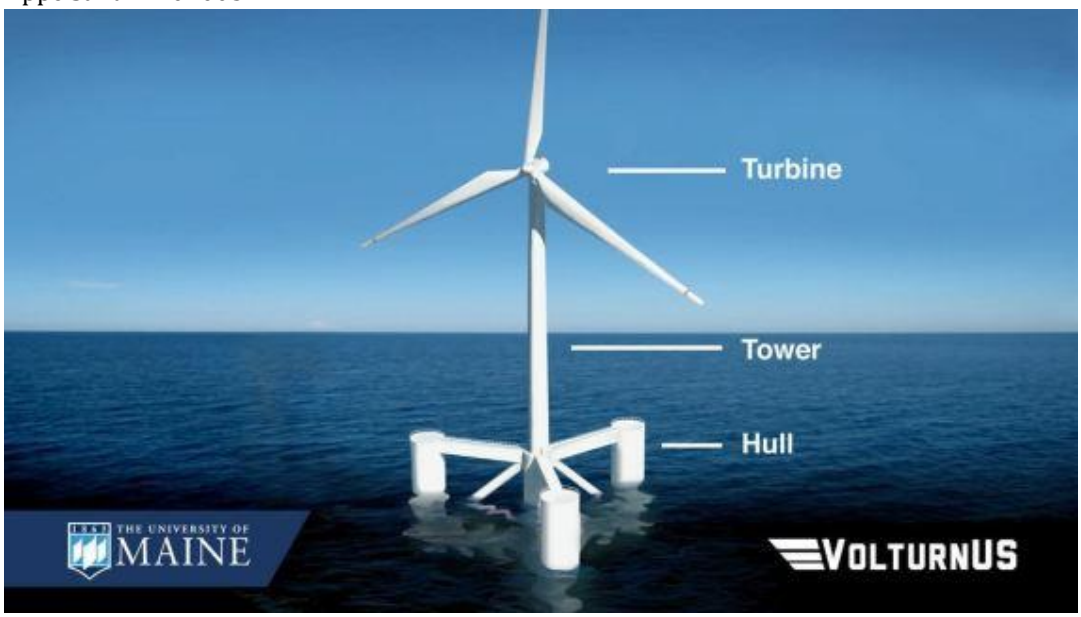


Figure 1: Parts of an offshore wind turbine (Volturnus)

2.1.2.1. Hull (Foundation)

It is located at the lowest point of the tower and its function is to maintain maximum stability, ensuring the vertical wind turbine. The hull can be piloted and floating.

2.1.2.2. Tower

It's part of the structure that supports the set formed by the nacelle and rotor blades. Typically, the design consists of a trunk of tapered tubular steel, inside is hollow so you can access the nacelle via a staircase. In addition, it is also where pass cables from the generator located in the nacelle to the ground.

2.1.2.3. Turbine

Inside the turbine there are different mechanisms that allow the conversion kinetic energy of the rotor in electrical energy. The gondola is located on the top of the tower, and is attached to this via a toothed crown, that allows the orientation of the rotor based on wind direction. In addition, the interior is also responsible for transmitting the force of the rotor and leveled it to the frequent rotation of the generator and cooling system.

Also right on the surface Outside there is an anemometer, a wind vane and lightning rods. The rotor is linked with the main axis and is divided into 3 parts: the fairing, hub and blades.

First, the fairing is the most frontal rotor and its function is to basically change the direction of the front rotor to avoid wind turbulence.

The hub is the piece that connects the blades to the main shaft and its purpose is to transmit the force wind into the interior of the nacelle. In addition, it also includes a control system of the angle of the blades.

The blades are built with materials with high tensile strength and fatigue. Commonly used materials such as fiberglass, polyester, fiber carbon and even wood.

1.2 Types of foundations

The foundation is the base that supports any structure. In the case of wind turbines, there are two types of foundations, the floating and piloted. The method of installation of the foundations of wind turbines depends on the location of the park and its dimensions as well as the entrances to the park (local delivery).

1.2.1 Foundations piloted

Currently, wind farms are in depths not exceeding 100 m and there are four types of foundations; gravity, monopile, jacket and tripod.

According to recent data referring to the foundations of offshore wind turbines installed in 2013, the monopile foundation has represented nearly three quarters of the wind turbines installed, while the jacket foundation is the second most widely used and less foundations measures tripod and gravity.

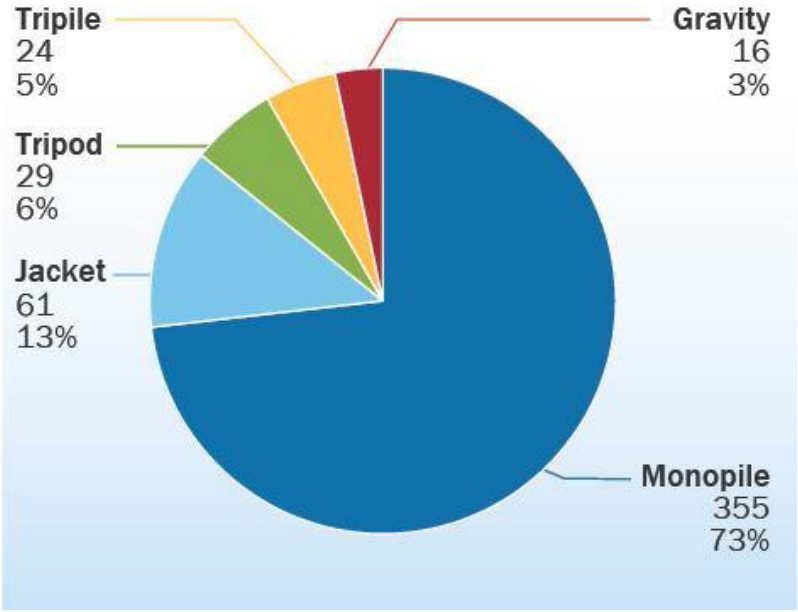


Figure 2: Data on foundations in 2012. (EWEA).

1.2.1.1 Monopiles

A monopile is basically a long tube that is nailed to the seabed by a large hydraulic hammer. The tube is made of steel. The monopiles are one of the most used foundations in offshore wind farms for several reasons as they are relatively cheap to produce, they are quick and easy to install and maintain.

The drawback of the monopile is the procedure used to nail these drivers due to the surface through a fixed hydraulic hammer makes the metal brittle and, therefore, unsuitable for load bearing. Therefore, the common solution is to adjust a piece of transition, which is another large driver positioned at the top of the monopile, so the slot is monopile piece to transition to a distance of 6 to 8 m.

In the case of the monopile, the principle remains the same as for the cementation of gravity: there are a number of boats and a lot of computers used to carry out the work of the foundation. Install a filter layer, which is formed by a layer of small stones used as a cover layer on top of the seabed to create a solid surface around the pilot.

Unlike the foundation by gravity, the monopiles requires no preparation of the sea-bed. Aside from designing a filter layer, the savings are significant in both time and expenses as they are reduced dramatically, which is why this type of foundation is currently used in most offshore wind farms. Furthermore, although only 3 or 4 years ago this method was not feasible to depths exceeding 25 m, it is good to know that now settle in places where there are defined depths to 30 m.

Figure 3: Monopile foundation (http://www.springerreference.com)

2.2.1.2 Gravity Base Structures (GBS)

The gravity -based foundations rest on the seabed. These foundations, which weigh 2,500 tons and measure between 15 and 25 m in diameter, are common but not many can manufacture bases in gravity, because models using concrete molds. These molds are very large and require much preparation time and rebar mold for

casting. Typically, there are between 6 and 8 molds and manufacturing begins between 9 and 12 months before the installation of the park with the goal of not having to stop the installation (for lack of foundations) once started construction of the park.

This means they manufacture and store a large number of rules, therefore, must be taken into account when assessing the port facilities, which have to be kept for some time before start the installation. This type of foundation is easy to install, but instead because of their high weight requires a lot of land on the base to withstand the pressure of the individual basis.

The installation of such a foundation can be carried out using three pieces of equipment, a floating crane capacity must be greater than 2,500 tons to lift and place the foundations on the bottom sea, a large barge that can transport and store a number of foundations on board and finally a tug or tugs group that can tow the barge and crane to its corresponding position. In addition to these pieces of equipment, there are of course several boats that carry out different works to prepare the seabed. This thesis is included dredgers to level the seabed and put a pillow of stone making is the found tion on firm ground and leveled.

The work of preparing the seabed cables begins with the opening of the around four to six months before the installation of wind turbines.

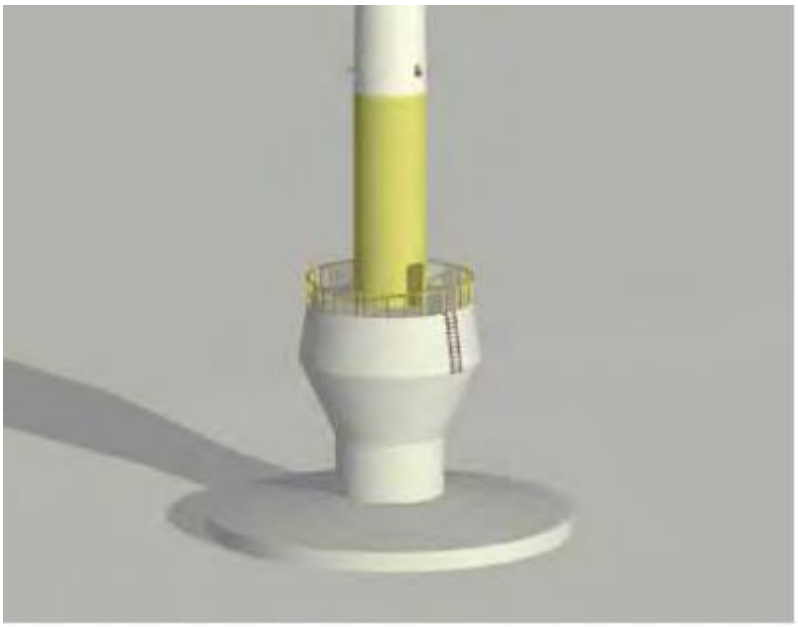


Figure 4: Gravity base foundation (http://www.springerreference.com)

2.2.1.3 Tripod

The foundations in tripod are designed for use in water 40 m or more (up to 50m).

A "tripod" is anchored to the seabed by steel piles.

Tripod foundations are more expensive than GBS, but they are more appropriate for the support turbines of 4-5 MW.

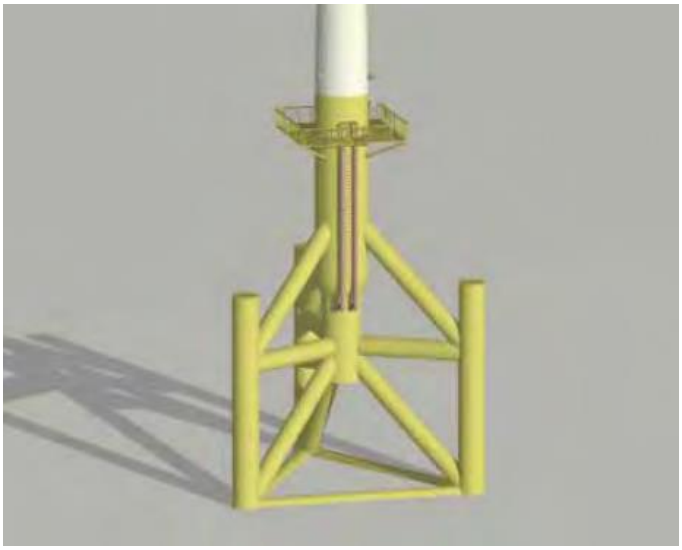


Figure 5: Tripod foundation (http://www.springerreference.com)

2.2.1.4 Jacket

A jacket is a type of foundation lattice structure, which uses the same principle of a lattice tower or a TV antenna mast radio transmission. A square cross section with members, structural tubes mounted on four corners, it can withstand greater forces.

Jacket foundation consists of steel pipes of smaller diameter of waves so that they can not degrade easily. In addition, the other two cases had a large cross section in the surface region located on the seabed from which protruded the tower.

This type of foundation is strong and lightweight at the same time, however, nodes or joints are very difficult to manufacture and therefore currently welds are made using traditional methods because there is no mechanical process joints that can produce efficiently.

So while the foundation type jacket has some advantages interesting, for example, the ability to withstand high wind turbines and the ability to stay in very deep water, and as also having a low manufacturing time as it is between 4 and 6 weeks. By contrast, the main drawbacks are the price and the complexity of their manufacture.

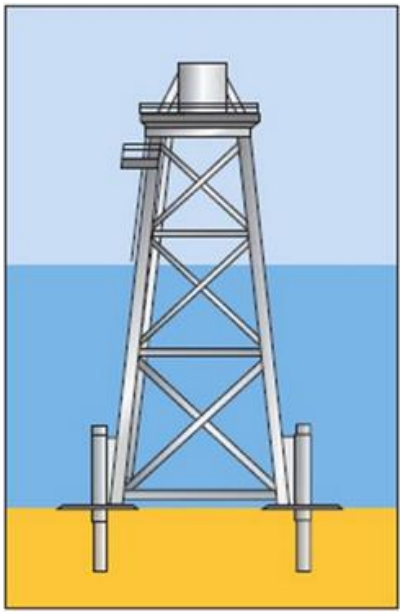


Figure 6: Jacket foundation (http://www.taiwangenerations.com)

2.2.2. Floating foundations

When the deep seabed is over 100 m is not a viable solution uses foundation piloted and is required when a floating platform. At the moment, there are only three technologies: Semisubmergible, TLP and Spar.

Semi- submersible floating technologies and TLP can be installed in a variety of depths, while the installation of the spar is more restrictive. Furthermore, it requires a heavier steel than the other two technologies as the escantilló increases with depth. TLP technology, the acronym comes from TensionLegPlatform is the most stable type as much as with restricted movements, pitch and roll. As for the construction and procedure for installation of the TLP and Semi can be considered simple compared Spar technology because this mode of operation has an upright. In addition, the first two technologies have a great difference to the Spar is allowing the assembly of wind turbine in the yard, while the Spar was performed retrospectively offshore boat with a specific this represents a significant cost.

The method of installation of floating platforms should be as simple as possible. The TLP requires a system that maintains the tension in the lines with the variation of the tides. It needs a system of transfer of ballast to compensate for the drain caused by the wind. In the case of Spar process is the most critical installation. Maintaining the Spar is more complex because as I said should be performed at sea and was a structure of great significance.

On the other hand, there is the possibility of a comprehensive anchoring in which several platforms share the same anchor point and thus reduce the number of anchors or pilot maneuvers and install them. In this case, the system has BPD is even worse because it only supports voltages vertical lines. All floating platforms require anchoring system. There are four types of drag anchors, nailing the pile or suction system with overhead cables and tensioning system.

2.2.3 . Anchor drag

Anchors dragging or retreat are most popular. Within this type of anchors have different types of design depends on several factors such as the area of Nail anchors, the shape of the rod anchor, soil type or the type of anchoring system, including others.

2.2.4 . Pilots and nailed suction piles

Another possible solution is the suction piles are steel cylinders that are placed vertically in the ground and the top have a system of pumps that extract water trapped so that the pile is introduced with background. There are also hooks stuck in piles pressure with large hydraulic hammers.

The configuration of the anchor can be varied. Each is characterized by the configuration of the line equipment that is used and the type of anchor. The arrangement is usually symmetrical, but if we are in locations with very directional seas may present a reinforcement of lines in the directions of prevailing waves and currents.

2.2.5 . Catenary system

The catenary system is the most common because it is a type of system used to moor ships, semi - submersible platforms and spar. The lines usually string up to depths of about 250-300 m. From there you can use different solutions mixed with chain and cable in order not to increase the weight of the anchor too. As the depth increases mooring lines require increasingly heavier. As to great depths, the weight of the chains may compromise the design of the floating structure.

2.2.6 . Tension system

Systems are similar to the tension catenary configuration. The main difference between the two is that the overhead has a horizontal section from the anchor until it begins to rise while the tensioning system allows tightening angle directly from the anchor. That is, at this point anchor system you can withstand horizontal loads and oblique, while the catenary system only supports horizontal loads .

2.3 Distribution of wind turbines

When determining the configuration of a wind farm, the distribution of wind turbines on the ground, should take into account both aspects purely wind at speeds, main directions, the characteristic arrangement of the machines and the distance between them, as well as characteristics of wind turbines themselves, as the size of the rotor and the type and height of the towers.

The grouping of wind turbines involves the use of large tracts of land because the wind turbines should be separated from each other, distances to avoid the influence of wind or shadows that produce their own turbulence. Ideally would align all turbines in a single row perpendicular to the orientation wind dominant. But sometimes that is not possible, therefore, when there is only Wind direction defined, down several rows aligned. But if the winds frequently have different directions, the turbines are arranged in parallel rows, so wind turbines in each row are placed in the middle of the

previous row. However, this leads to a slowdown in the wind and obtaining to convert wind energy - into electricity. For this reason, turbines should be separated as much as possible in the direction of the wind. Other hand, for reasons of cost connections of these to the grid and reducing electrical losses caused to the cable, the wind turbines are closer together.

Thus, the optimal distribution is already mentioned, the gate, as the footsteps of a wind turbine, less may affect others who are on the back. In addition, the effect of the wake is greater wind direction than in the perpendicular direction. Therefore, in order to avoid turbulent flow caused by the wake, in general, the separation between wind turbines in the same row must be between 3 and 5 times the diameter of the rotor; the same way, the distance between rows should be a distance between 5 and 9 times the diameter of the rotor

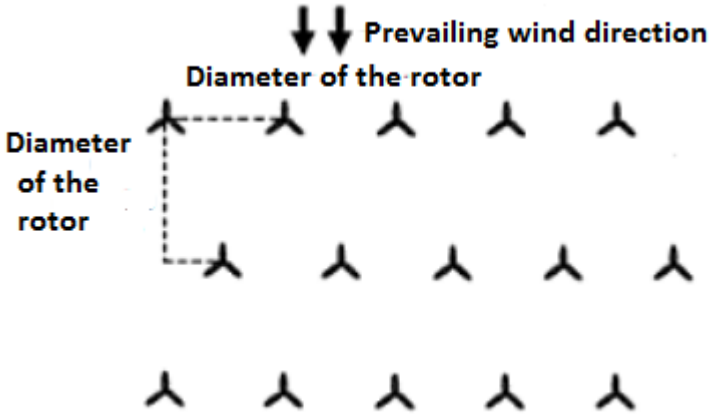


Figure 7: Disposition of the staggered wind turbines. (Danish Wind Industry)

The power unit of the wind turbines is increasing, so sometimes we make a wind repowering consisting replace older and less power for other newer and more powerful so in the same area there are a number slightly higher than power.

2.4 Comparison between the onshore and offshore wind

Both terrestrial and marine turbines take advantage of the wind's kinetic energy and transform it into mechanical energy and electricity, but there are some peculiarities that differentiate them and worth mentioning.

2.4.1 . Roughness and height respect to the surface

To the most important factor that makes the difference between a wind turbine located at the surface or in the sea is rough and the surface height with respect. The second is the wind friction with the surface, which produces a decrease in the speed of this. The roughness of the sea surface is negligible (0.0002 m- Class 0) compared with the ground (0.4 - m Class 3) that due to the terrain, and topographic effects such as mountains, forests, etc.. The wind makes it look more restrained. As shown in Figure 8, the first graph, which corresponds to the roughness of the sea surface, the velocity profile is constant regardless of height, while the first, which corresponds to the roughness a surface, the velocity profile is more variable with height. Therefore, in this case, is an important factor to consider.

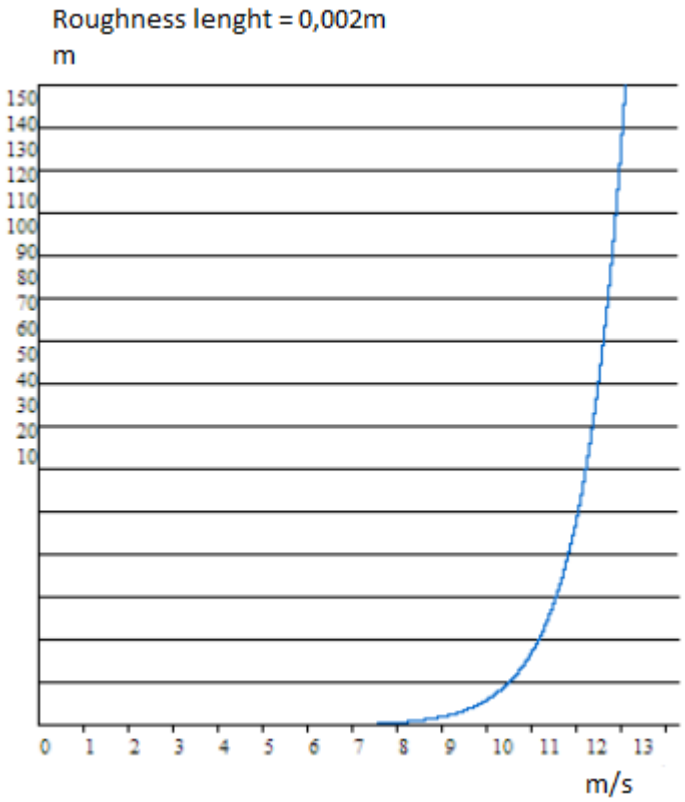


Figure 8: Velocity profiles at sea. (Danish Wind Industry AsAssociation).

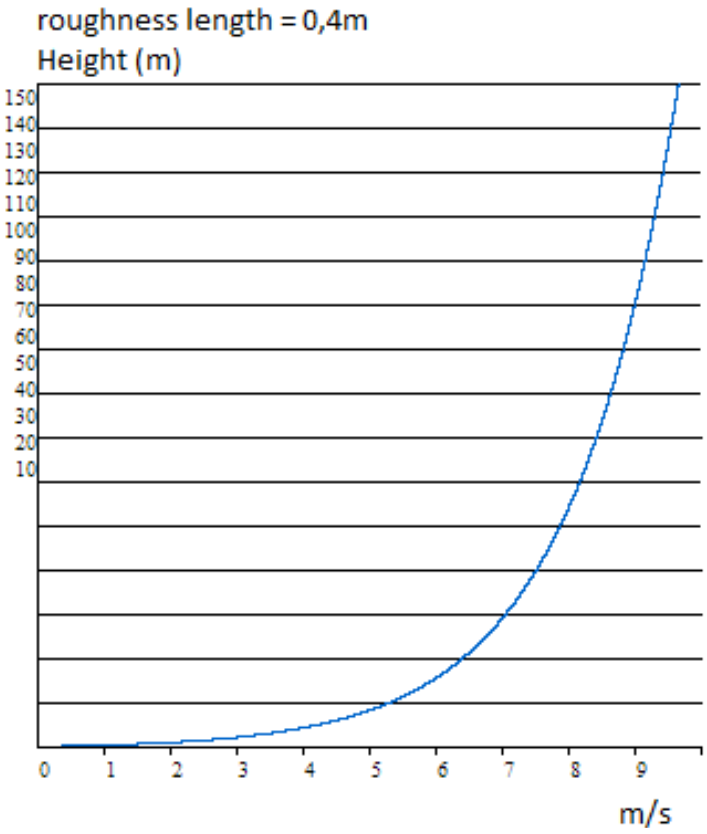


Figure 9: Velocity profiles in land . (Danish Wind Industry Association).

However, depending on how the land can be achieved have higher wind speeds, for example, placing wind turbines on top of hills and also at the bottom of a valley.

In the case of the hills always appreciate wind speeds higher than surrounding areas. This is because the wind is compressed by the mountain facing the wind, and once the air reaches the top of the hill can again descend expand into areas of low pressure to the leeward side of the hill, this effect is known as "effect Venturi. "As a valley, the air is compressed in the part of the mountain that is exposed to the wind and its speed grows considerably among the obstacles the wind, this is what is known as "tunneling" thus placing a wind turbine in a valley is a way Smart obtains wind speeds higher than areas adjacent.

'Moreover, it is recommended that impacts the entire wind swept area at the same speed of the turbine to operate correctly. This has two advantages as one of the most important wind energy is increasing wind speed with altitude, and also a higher level implies a lower roughness and velocity is uniform only depends on meteorological factors. An approach, which describes the phenomenon of, increased wind speed at a certain height (H), knowing the reference speed (v_{ref}) at a reference height (H_{ref}) that also depends on the type of surface (z_0) is expressed by the following formula:

$$v_h = v_{ref} * \frac{Ln\frac{H}{z_0}}{Ln\frac{H_{ref}}{z_0}}$$

Equation 1: Speed respect to hub height

2.4.2. Installation and maintenance

One of the main drawbacks of any wind farm located in the sea is the amount of resources that are necessary to put into service the park. The fact is that the sea makes, first, increase the difficulty of access to the site, it requires the use of specific boats and large to transport the materials as well requires the use of heavy cranes to perform the construction. Moreover, the difficulty in building the foundations, which in the case of offshore, it is very different and requires more drilling method complex in the case of traditional wind farms. Furthermore, the maintenance of offshore wind farm is always higher in absolute terms, but in relation to power unit, traditional parks.

2.5. Perspectives offshore wind

2.5.1 Global context

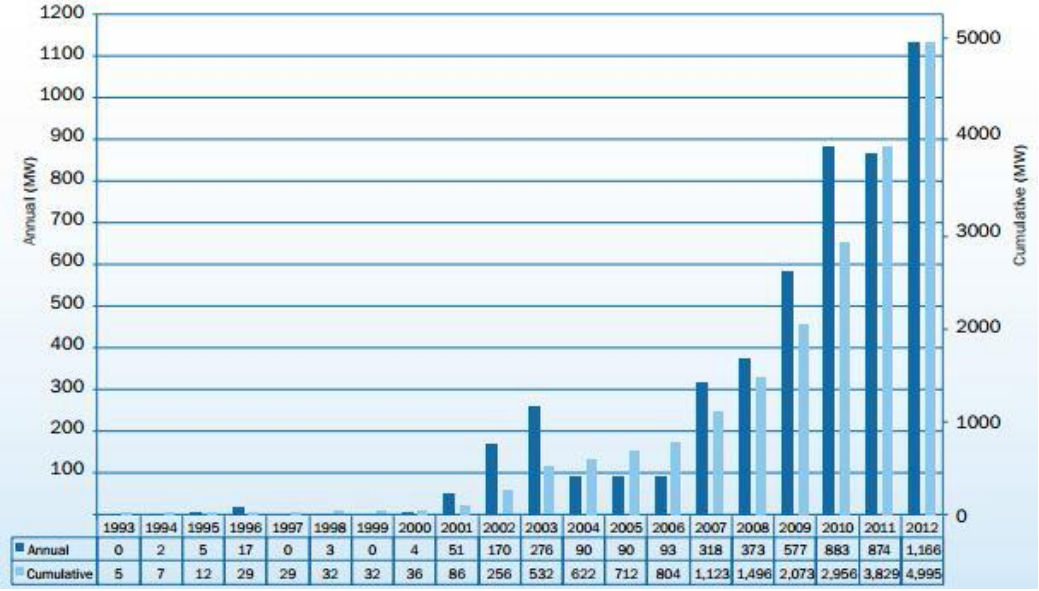
According to statistics from the Global Wind Energy Council, the wind industry is in an expansion with an annual growth rate of almost 10%, with China and the United States in the lead, being the first country with more installed power installed in 2012.

The Chinese market has slowed slightly last year with a total of 13.2 GW, while the United States installed more than 8 GW just the last quarter due to the anticipated expiration of tax credits production, which in 2012 installed capacity of 13.1 GW. Meanwhile, in Mexico doubled its installed capacity to 801 MW for a total of 1370 MW.

As for European countries, mainly led by Germany, the UK and Denmark, and the entry of new countries in Eastern Europe such as Poland and Romania; 2012 was 12.4 GW of installed wind terrestrial and marine. Due to the economic and financial crisis, the prospects for 2014 are uncertain, although the targets set for 2020, make it far, keep some stability to these prospects for future installations. Europe continues to lead in the field of offshore wind with an installation of more than 1,100 MW, 10% less than the 2012 goal to achieve installations offshore, 1,300 MW.

According to EWEA (European Wind Energy Association) at the end of 2012 there were already 5,538 MW of offshore wind power installed worldwide, of which 90% is in Europe while China and Japan had 33.8 and 509.5 MW, respectively.

Within the European market for offshore wind stands above the UK with almost 60% of the total capacity installed, and follow Denmark and Belgium with a share of 18 and 8 %, respectively. At the end of 2012 there were 55 offshore wind farms, of which 20 are in the UK and 12 in Denmark, with 870 turbines and 416, respectively. Regarding the development of offshore wind power capacity installed during the past 20 years has been continually growing each year surpassing the previous one, so until 2000 the industry was virtually dead and splendor originated from 2001, as shown in Figure



	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Annual	0	2	5	17	0	3	0	4	51	170	276	90	90	93	318	373	577	883	874	1,166
Cumulative	5	7	12	29	29	32	32	36	86	256	532	622	712	804	1,123	1,496	2,073	2,956	3,829	4,995

Figure 10: Evolution of offshore wind power capacity installed in Europe since 1993. (EWEA).

The only drawback is that offshore wind, according to EWEA, it is expected that the total installed capacity to 5,300 MW in 2012 was when it was only 4,995 MW installed, while onshore wind generated about 101 thousand MW when EWEA predicted about 98 thousand, ie, they install over 3,000 MW.

In terms of wind power capacity installed annually offers about 230 TWh, ie, it represents almost 7% of final consumption in Europe. But the distribution is very uneven across countries, where Denmark is the country that has a higher penetration of wind relative to its total electricity consumption, with 27% , followed by Portugal and Spain with 17 and 16 %, respectively.

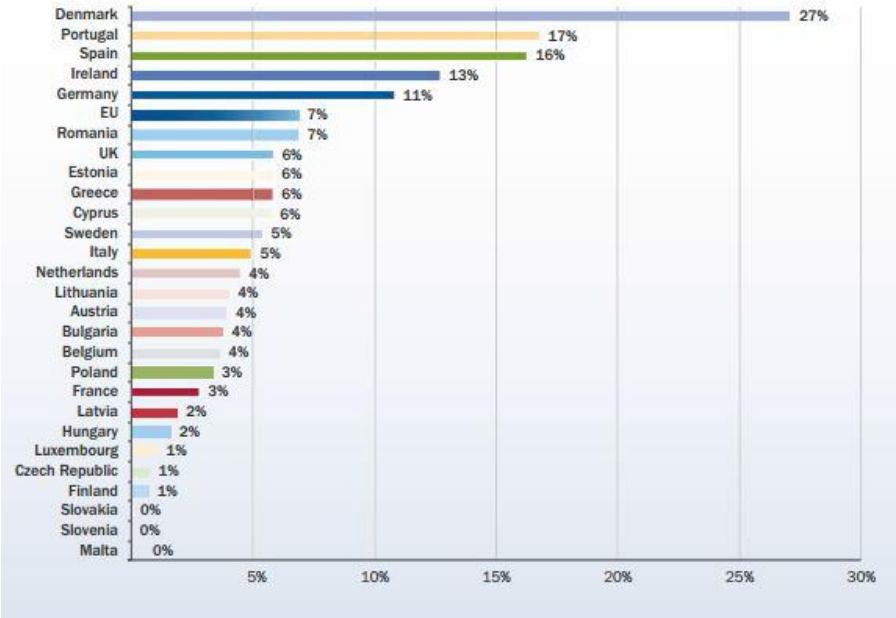


Figure 11: Evolution of offshore wind power capacity installed in Europe since 1993. (EWEA).

2.5.2 Denmark context

Denmark is the country that started the offshore wind energy and its seas are now the largest parks of wind turbines. The offshore wind farms in Denmark are Horns Rev (160 MW) on the west coast of Jutland, and Nysted , Lolland near (158 MW). The Danish Energy Plan, Energi21 was set (1996) as a target for 4,000 MW of off-shore wind power in 2030. 4,000 are expected MW of wind power produced 13.5 TWh of electricity per year, equivalent to 40 % consumption in the country. The over-all goal is to reach 50% of energy is produced from wind power. The island of Samsø has a particular installation of 10 turbines. The 20 generators each produce Mid-delgrunden equivalent to the consumption of 1,000 families. Tunø generators Knob (1995), as the noise is not a problem, they were allowed a speed 10% greater, so that the performance is increased by 5 %. The towers incorporate a crane to mount electrical components without help. The wind on the sea behaves more consistently across its surface and variable unobstructed roughness. They can be located lower than ground towers. Greenpeace is committed to the wind turbines on the coast for its renewable nature and its low impact on the ecosystem.

http://www.mgar.net/soc/eolica.htm

2. Implementation of marine generation platform

3.1 Site location

The place that was chosen for the construction of the platform of the windmills and marine buoys is the northwest town of Hanstholm, Denmark, 3 wind turbines an 6 marine buoys will be installed. The distance to the coast is about 5Km and depth does not exceed 50 meters

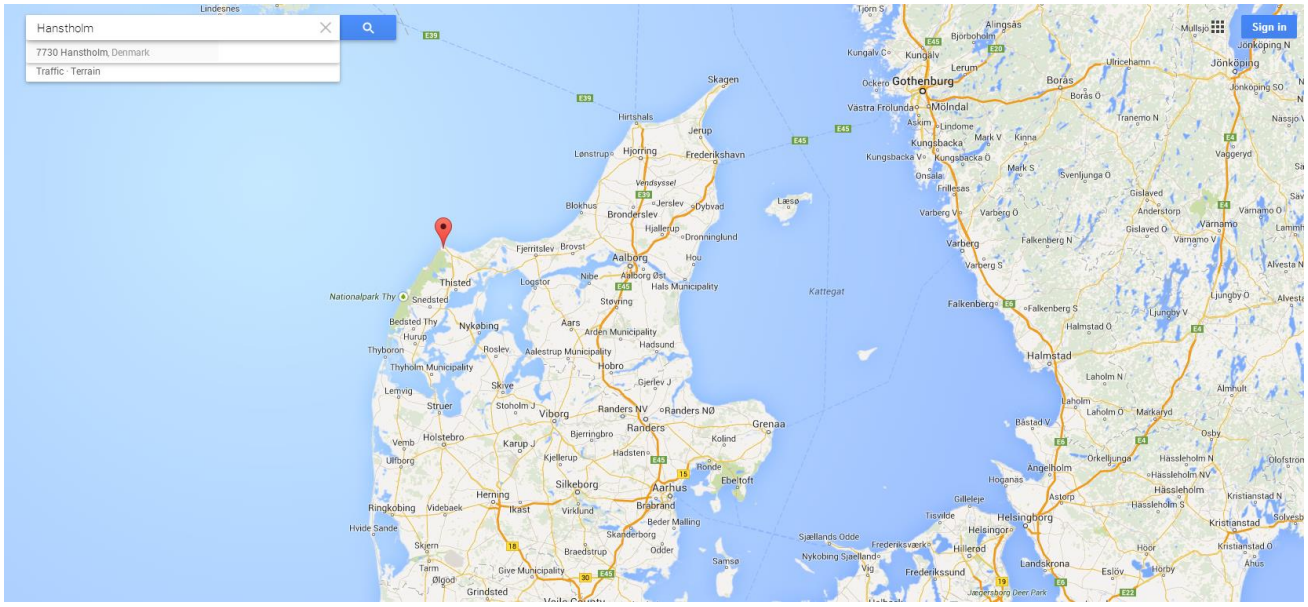


Figure 12: Point of installation (google map)

It is chosen this place because in these waters the wind reaches high speeds as seen in the figure 13, red color indicates that there, the wind speed is high.

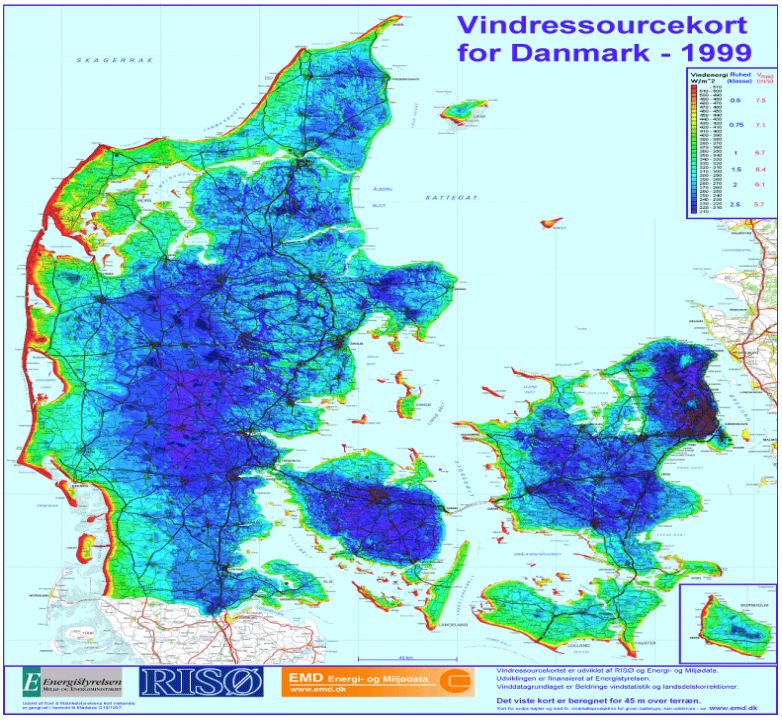


Figure 13: Wind resource Atlas of Denmark (Danish Energy Agency)

3.2 Selection of the wind turbine

It is known that the unitary power of the wind turbines located offshore is much higher than that of wind turbines are on land. The main wind turbine manufacturers are Siemens and Vestas. Before choosing the wind turbine has been studying the feasibility of various wind turbines:

Model of Vestas V112 -3.0,
the model SWT - 3.6 -107 of the German Siemens
Haliade 150 of Alstom and
Repower 5MW

The range of wind turbines designed to be installed offshore is greatly reduced since most of them are size and high power reduced and, therefore, are to be mounted on the surface. The selection of four wind turbines is based on the technology that these are the ones that have a technology leader and the rated power as you need to have a higher power rating status.

Wind technology has always tended to optimize the parks installation of wind turbines increasingly powerful since, although the cost of these is greater, decreases the overall cost of the park because it is installed fewer turbines. Therefore, as can be seen in the Appendix II, the chosen wind turbine this facility is the model 150 Haliade manufacturer Alstom. It is a wind turbine with 6 MW rated power (the greater power currently on the market), so the wind turbine is which has a greater surface sweeping and length of the blades is 73.5 m. The 150 is equipped Haliade a permanent magnet generator three converters and 900 V.

Each "Haliade 150" can generates the energy needed to power 5,000 homes. While this turbine was built to fit "off shore" or far from the coast, as prior to its official certification phase, the first turbine shall be tested on land for a year. By November of 2012 one second turbine will be installed in the sea, on the Belgian coast. Mass production is scheduled for 2013 and will begin officially marketed between 2013 and 2014.

http://www.energias.bienescomunes.org/2012/10/26/alstom-haliade150-la-turbina-eolica-mas-grande-del-mundo/

Figure 14: Haliade 150 (Alstom)

3.3 Rose winds and predominant wind direction

As the wind rose, this has been calculated in the town of Hanstholm, in a point very close to our platform.

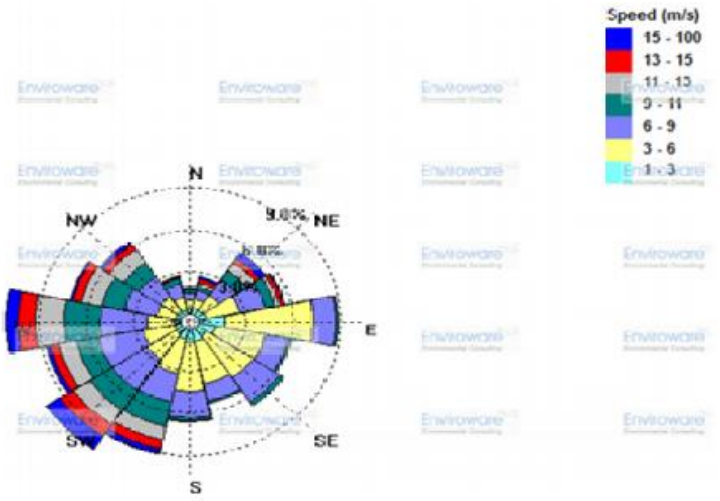


Figure 15: Wind Rose, DanWec data from 2004-200

According to Figure 15, which is obtained in DanWEC, it can be seen predominantly southwest winds. Consequently, should direct the wind turbines in wind direction predominant

3.4 Distribution of wind turbines

To avoid the influence of the wake factor, the wind turbines will be distributed in the south-west, on the other hand, reduce interference and turbulent flows that may occur between turbines, knowing that the diameter of the rotor is 150 meters, the separation distances are, at least 450 m in the perpendicular direction to the wind direction. The geometric coordinates of 3 wind turbines are given in the table 1.

A	57,158 N 8,559 E
B	57,158 N 8,551 E
C	57,162 N 8,555 E

Table 1: Coordinates of wind turbines

In figure 16 we can see the exact point (A) where it installed the first of the three wind turbines.

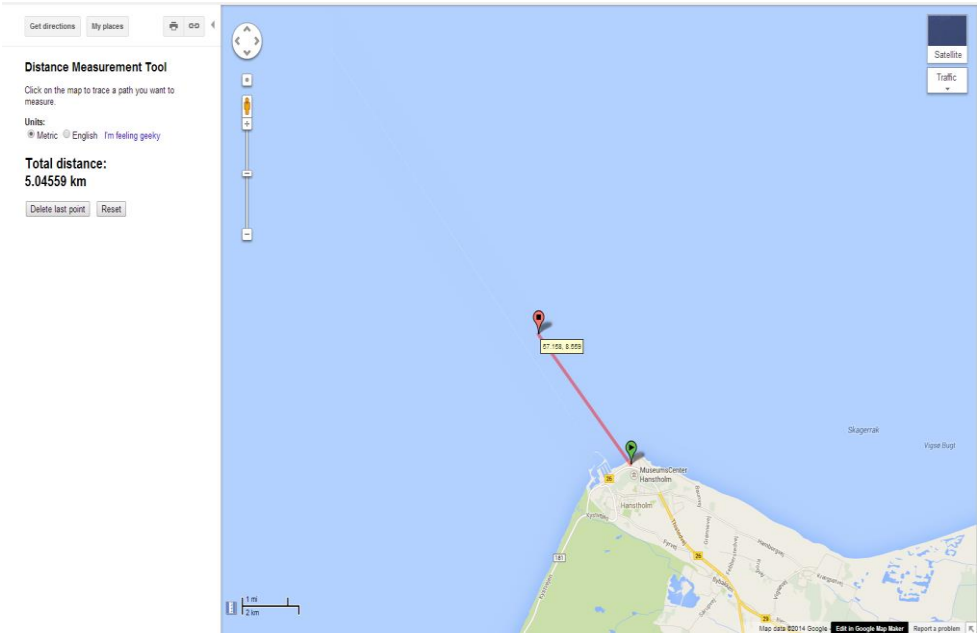


Figure 16: Point of first turbine respect to the coast (google map)

The Figure 17 shows the second point where the turbine is installed (B)

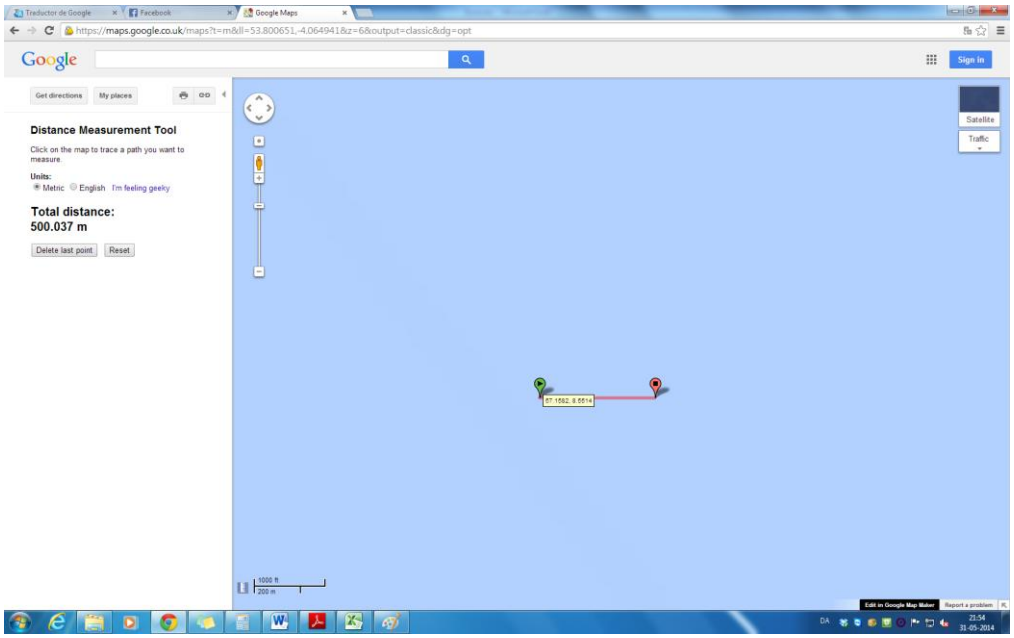


Figure 17: Point of second turbine (google map

And finally the third point (C)

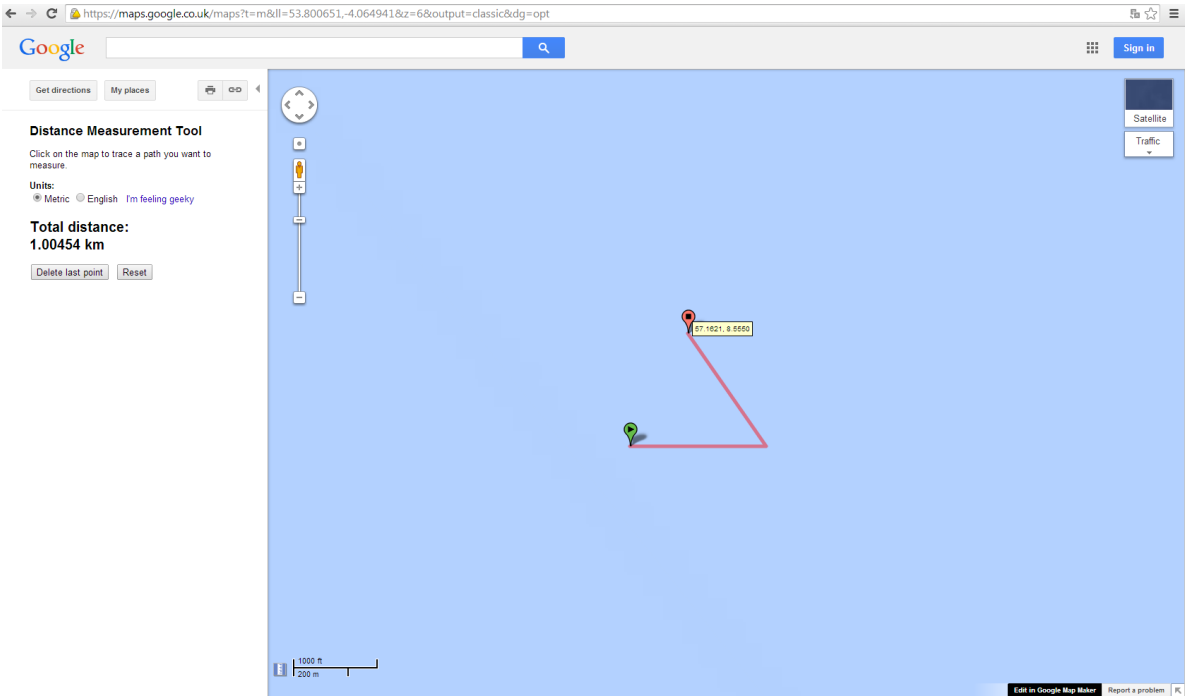


Figure 18: Point of third turbine (google map

Regarding the bathymetry, that is, the depth of the area where is located the generating platform It is can said that the depth of the zone ranges from 40 and 50 m below the surface the sea. Therefore, in our case, wind turbines can be installed with foundation piloted,

Of the four types of platforms piloted in this case will be a featured many of the technologies that are incorporated into piloted platforms.

3.5 Selection of foundation

For the laying of the foundations of the turbines, it has chosen a foundation type Jacket, Mainly, because Haliade 150 turbine has been tested successfully with this structure, and having no more than 50 meters profundiad where we have performed the installation, I think it was the best option.

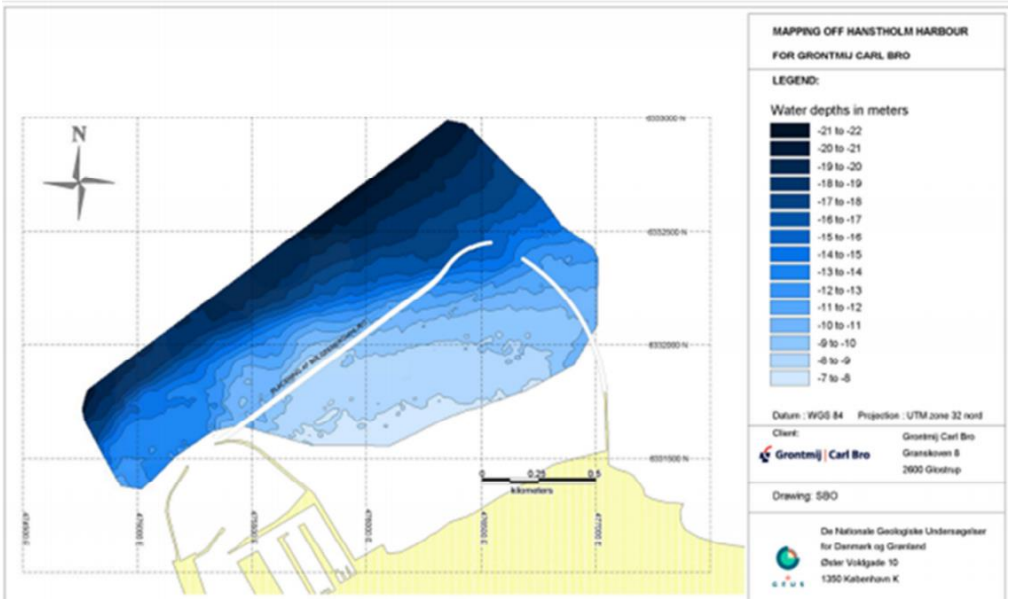


Figure 19: bathymetry

(http://vbn.aau.dk/files/55412302/Characterization_of_Wave_Climate_at_Hansholm_Location_with_Focus_on_the_Ratio_between_Average_and_Extreme_Wave_Heights.pdf)

There are different variants for the installation, it may be 3 or 4 feet in this case it is used 4 legs batteries consist of the structure with struts interconnected with diameters up to 2 m, tubular joints are welded.

The transition piece forms the connection between the main housing and the tower of the wind turbine. The loads are transferred through the main members in axial direction. There are secondary steel for the ladders, access system, etc..

The union of the structure with the seabed will be made by the method of pre-stack

Figure 20: Method of pre-stack (www.4coffshore.com) **OWEC Quattropod®**

During this method templates submarines are used to secure the position of the piles.

“ The advantages of such methods are :

- Pile sleeves and mud mats are eliminated on the jacket
- Piles can be installed well in advance of the jacket and wind turbine generator installation
- Fabrication of jacket can be Conducted in parallel with piling operations
- Seabed variations can be leveled by varying pile stick –up
- Ensures leveling Seabed Standardisation of jackets
- Verticality of jacket is Easily arranged. “¨

http://www.4coffshore.com/windfarms/jacket-or-lattice-structures-aid271.html

There are different variations of this structure has been chosen OWEC Quattropod ® is a complete substructure (jacket foundation and transition piece) Particularly suitable for larger turbines. It has-been developed by OWEC Tower.

Figure 21: Jack foundation (OWEC Quattropod®)

“ Technical and operational advantages comprise:

- No seabed preparation is normally required
- OWEC Quattropod® is designed so that no scour protection is needed. Adaptable for a wide range of water depths from onshore / shoreline to deeper waters
- Provides a wide range of installation tolerances to reduce the complexity of operations
- Variation in seabed level can be adapted by adjusting pile stick-up length and/or OWEC Quattropod®'s height, keeping the number of clusters required for an offshore wind farm's water depth range to a minimum
- Helps in meeting environmental regulations, by providing small-diameter piles for OWEC Quattropod®, which produces less noise during installation compared with monopile concepts
- Adaptable to small and large capacity turbines (3MW-8MW)
- Can be easily designed to meet the frequency requirements of the wind turbine generator (WTG) manufacturer

- Midsection (transition piece) is designed to transfer forces efficiently, allowing for a simplified OWEC Quattropod® concept, which reduces total cost
- Designed to comply with Construction Design and Management regulations for specified site requirement ”

http://www.power-technology.com/contractors/renewable/owec-tower/

3.6 Capacity factor

Finally, the capacity factor is the division between the energy that produces a plant for a period of time and the amount of energy at full capacity. With this factor we can check whether the construction of the plant is viable or not, for wind turbines capacity factor must be between 20 and 50%, but the plant is also not feasible to be built

$$K = \frac{Total\ amount\ of\ energy\ the\ plant\ produced\ during\ one\ year}{Mount\ of\ energy\ the\ plant\ would\ have\ produced\ at\ full\ capacity} * 100$$

Equation 2: Capacity factor

As it can seen in Appendix II, section 2.3, the capacity factor is 48.3% therefore is an excellent factor for the realization of wind plants, here a table with different ranges.

Table 2: Ranges of factor capacity

Capacity factor (K)	Qualification
Less than 0,2	Unacceptable
0,2-0,25	Acceptable
0,25-0,3	Good
0,3-0,4	Very good
0,4-0,5	Excellent
Bigger than 0,5	Extraordinary

4 Economic viability study

In this chapter, it will try to know the approximate total cost all power generation platform.

Due to the opacity of suppliers in terms of publication of prices of different elements that are part of the generating platform, we choose conservative values normally used as a reference for each element.

4.1. Initial Investment

4.1.1. Classification of costs of wind turbines

So below is broken down through tables, various cost elements that are part of the project. To calculate these costs with values more conservative and realistic as possible.

4.1.1.1. Turbines

We conducted a consultation company Alstom to give us a more accurate figure of the cost of wind turbine Haliade 150, but due to the inability to get this price, we see in the table, the estimated total cost of wind that I could find in other publication

4.1.1.2 Turbines platforms

Turbines	
Model	Haliade 150
Number of the turbines	3
Power of turbine	6 MW
Cost per turbine	6.900.000 €
Total cost turbines	**20.700.000 €**

Table 3: Costs of turbines

Turbines platforms	
Model	OWEC Quattropod ®
Tons of Steel (each platform)	600
Cost of steel €/Tn	620
Total cost per platform	372.000 €
Total cost 3 platforms	**1.116.000 €**

Table 4: Costs of structures

Below is shown the cost of manufacturing and installation of 3Jacket platforms., I'm looking for information in different articles, because I could not get information from the company

CONCLUSION

The analysis of offshore wind energy, considering the advantages and disadvantages regarding the use of energy resources as its implementation and concepts relevant to note, I have come to the conclusion that wind energy is not only an inexhaustible source of energy, but also, nowadays we can say that it is competitive, since it can provide a significant amount of clean energy profitably, alleviating the effects of climate change. Moreover, thanks to technological breakthroughs and increased generating capacity of wind turbines has been experienced over the past 10 years, wind energy has been placed in a leading position to compete with other technologies for power generation more conventional.

1. WAVE ENERGY

1.1 INTRODUCTION

The amount of solar energy reaching the Earth's surface is about 108 billion KW/s. The energy received from the Sun is endless and low density as well as the large amount of energy we have accumulated in the sea, given the vast size of the ocean waters, about 361 million km^2 and 1370 million km^3 volume. The energy potential are important, according to the different natural processes that occur in the sea, can be approximated to: thermal gradients ,40,000 million MW ; salt gradients ,1,400 million MW; ocean winds , 20 million MW ; currents , 5 million MW; tides and waves , 3 and 2 million MW , respectively.

The energy utilization of some of the marine natural phenomena mentioned are almost nonexistent such as the thermal gradient and Saline gradient, due to the characteristics of the resource and the high costs associated with their use. Moreover, the energy of tides, waves and ocean currents are in advanced phases .

1.2 DISTRIBUTION OF WAVE ENEGY RESOURCE WORLDWIDE

Firstly, we should mention that like any other renewable energy, wave energy is not evenly distributed throughout the planet but is scattered, ie , there are regions

where a high energy potential wave is concentrated, while in others areas exist a low level of harnessing wave energy .

The regions where increased wave activity is concentrated are those that fall between the 30º and 60º of latitude in both hemispheres. This makes the west coast of North America, much of the west coast of Europe, Chilen coast , the South African and the southern coast of Australia and New Zealand are the areas of the world where there is a greater energy potential wave , located at a range of 40 to 70 KW/m . Instead, those areas with a high concentration of islands such as the Caribbean Sea and the Indonesian islands; or those with a very tight low sea surface have poor harnessing wave energy , range 3-15 KW/m.

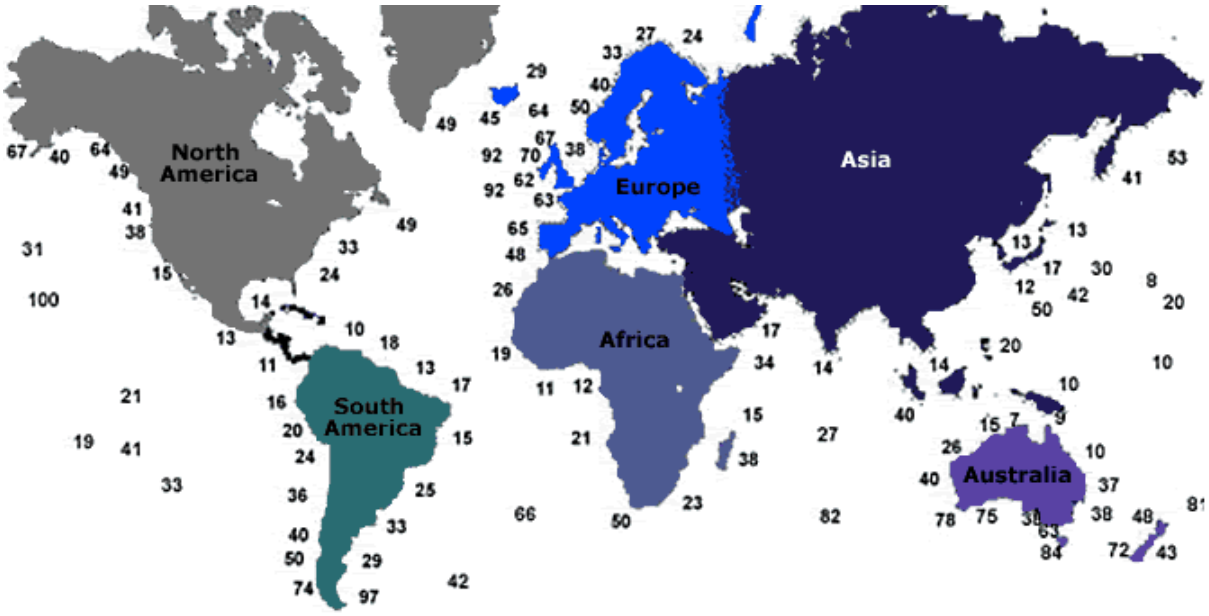


figure 22: World map showing average wave power in KW/m wave front. (www.madrimasd.org)

Moreover, the power that can be reached is proportional to the speed of displacement of the wave and height squared. For this reason, the height of a wave is a high indication of their strength, so that when the sea is rougher, will be more potentially fruitful, also will be more difficult to obtain their energy because of the destructive force of the wave, it may end up destroying the devices that allow us to transform the energy into electrical energy.

$$P = C_g * \frac{\rho g H^2}{8}$$

Figure 1 gives the average height across the globe. The areas where greater heights exist are the places where there is a greater energy potential mentioned above.

Equipment must be designed so as to be able to absorb enough energy in the worst months without destroy the devices or reducing its life drastically.

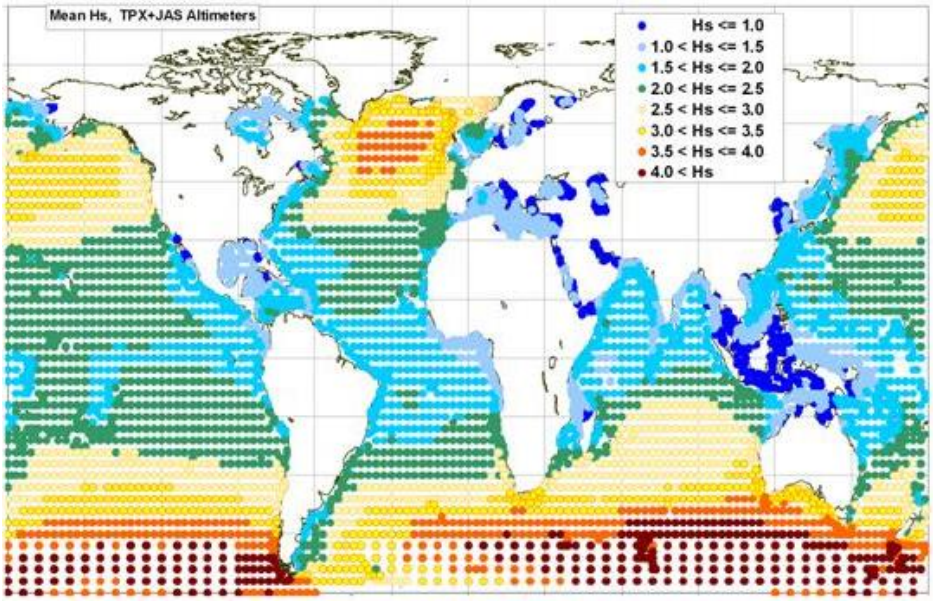


figure 23: Significant wave height. (Oceanor)

1.3 CURRENT AND FUTURE PROSPECTS OF WAVE ENERGY IN EUROPE.

Today in several European countries together with others of the rest of the world already have research programs on the wave energy. The degree of involvement of each of the countries in these programs depends largely on the availability of energy resources of the sea. Due to the fact that in countries with a high oceanic resource they can cover a significant part of the energy demand from the wave energy, and even can get to turn this energy into a primary source and placed above fossil resources.

Besides, the countries where the fossil resource is scarce, wave energy can be used as an additional source of energy from other renewable sources such as wind, solar energy, thus increasing the importance of renewable energy sources.

In Europe, Denmark, Sweden , Norway , Portugal , United Kingdom and Ireland are the European countries with the largest resource of wave energy and therefore have promoted and participated in many wave energy projects over the past 20 years, thanks in part to the government support.

These countries are exposed to winds from the Atlantic Ocean which are strong winds. For this reason, present wave power levels between 60 and 70 kW / m of wave crest length in the west and northwest of Ireland and Escocia coast, and to a lesser extent on the west coast of Norway.

The Scandinavian countries were the first who started using these programs, to the 1970s. One of the most outstanding achievements was the launch of TAPCHAN in Norway in 1985. During 1978, the Norwegian Ministry of Petroleum and Energy began to finance programs related with two major projects, one focused on sub-merged structures and the other TAPCHAN, to later invest in the development of the OWC . Government financial support was highest during 1980 but was substantially decreasing the following years.

In Sweden there are few profitable areas to use wave energy, estimate that they can generate between 5 and 10 TWh per year from the waves. The incorporation of the research programs of wave energy was the result of a research foundation of the Technological University of Chamero, Gothenburg in 1977 with the support of two companies. Focused mainly on the study of oscillating devices, but also participated in other projects JOULE program during the 1990s.

In the northwestern regions of Denmark has estimated annual wave power be-tween 7 and 24 kW / m from the west, which generates about 30 TWh per year. In-volvement in the study programs of the energies of the sea did not occur until 1997 as a result of the policy proposal that emerged in 1996 in which wanted to promote and develop new methods of storage and renewable energy resources. This pro-posal involved a financial support of 40 million Danish crowns between 1998 and 2001, under the supervision of the Danish Energy Agency. Furthermore, the Europe-an Union also was involved in it through the JOULE program Francisco Vives UYA . In 1997 was selected and provide financial support for the construction and testing to more than 35 projects.

Regarding UK, a country where predominate strong winds from the west and big waves, their wave energy resource available is approximately 120 GW . The investi-

gation of energy resources from the sea began at the University of Edinburgh after the oil crisis of 1973, with the publication of the investigation of wave power devices and the Salter Duck. The government did not participate until 1983. Years later, in 1999 the British government was in favor of the incentive of wave research with a budget of over € 5 million until 2003.

As regards to the other European countries, for political reasons or the approach to other sources of energy, wave energy has not had a significant development, although many of them have great waterfront such as France, Spain, Italy, Greece, and smaller countries such as Belgium and the Netherlands.

Of all European countries, Nordic countries and the British Isles are in the head in terms of investment and involvement in marine energy and which are the areas where there is a greater potential for wave energy.

In fact, the country that leads the development of renewable sources of marine origin is United Kingdom since from 2002 to 2006 pounds has allocated almost 15 million in investigation and develop. In addition, a program of 42 million was approved by the next three years.

1.4. ADVANTAGES AND DISADVANTAGES OF WAVE ENERGY

Worth noting that the wave energy is more stable than the wind because it is a concentrate, predictive and higher resource availability because there are always waves also is a resource that is not far from urban areas and also many large cities around the world are on the coast.

1.4.1. Advantages

→The waves can travel long distances without losing a lot of energy.

→ It is a resource to consumers nearby .

→ Provides high availability because it is an abundant and continuous resource with high energy flows .

→The development of this energy can increase the proportion of renewable energy compared to fossil resources. Thus, along with other resources such as solar and wind energy, which are resources that exist in the Spanish territory, can help achieve European targets for energy efficiency set for 2020.

→ It reduce the impact of erosion caused by the waves in ports or artificial areas.

→ It is a type of renewable, inexhaustible and clean energy, in addition, does not emit greenhouse gases .

→ Have alternative uses and derivatives, in addition to electricity, which are also essential for the population, for example, hydrogen production by electrolisys and obtaining drinking water from the sea.

→ Promotes new lines and business opportunities and diversification of jobs, especially for the marine industry.

1.4.2 Disadvantages

The devices capture energy from waves are weak against major storms, since the load that the devices have to bear under the worst conditions are much higher than the rated load. However, although the conditions are optimal, these devices must withstand the kinetic energy of the waves without interruption.

→ The devices that are located offshore have very high costs due to different concepts, installation, maintenance, mooring systems and should be reviewed more frequently.

→ The sea water, salt, has very devastating effects on different types of materials. Corrosion is a major inconvenience for materials.

→ The design of the devices is complex, which makes the cost of construction (mooring systems, seals, etc..) and the transport of energy are very high, though, the energy source is free. Therefore, currently, the cost is not competitive with other conventional power.

→ The use of wave power has a considerable negative impact on the environment, highlighting the alternation of maritime climate, and consequently the fauna and flora; and may also have negative implications for economic activities in the fisheries sector, maritime transport and tourism sector.

1.5. WAVES THEORY

1.5.1. Waves origin

Sea waves are a tertiary derivative of solar energy due to solar heating of the Earth's surface causes the appearance of the winds and these are responsible of the waves generation. Thus, the solar radiation incident on the Earth surface, it does not

produce a homogeneous heating, instead it does appear areas of high and low pressure. Additionally, this fact generate different air densities causing displacement of air or wind of varying intensity and its friction with the sea waves results. It is estimated that approximately 0.3% of the solar energy is converted into wave energy. Waveform depends on the intensity and duration of the wind, moreover, the length over which the wave energy is transmitted .

The waves act as a mechanism of energy transfer of the wind, in the sense that they are able to receive energy and transport over long distances. Since the density of water is much higher than that of air, this fact makes the surface of the waves have more freedom for translational movement, forcing the waves to transmit energy over the surface. They also have a great capacity to move long distances without large energy losses, so that all the energy accumulated throughout displacement ends focusing on the coast. Although losses are minimal the density wave decreases as it approaches to the coast due to interactions with the seabed.

1.5.2. Waves description

The intensity and degree of development that the waves takes depend mainly on the following factors:

- The intensity or force with which the wind blows.
- The time that the wind blows in the same direction.
- The fetch or distance over which the wind blows in the same direction.

The figure below shows how the wind interacts in fetch with the free surface of the sea, forming irregular waves. As these propagate, resulting grouped more regular waves. According to Fernández Díez distinguish three areas: of growth, of fully developed sea and extended sea.

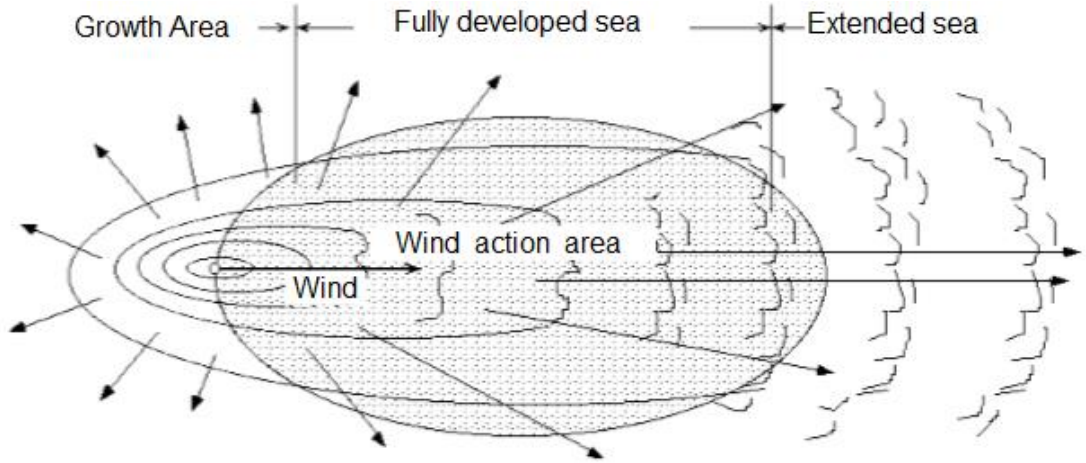


figure 24: Wind action acting on a particular area of the sea (Fernandez Diez, P. 2005)

The swell in the growth zone is chaotic, it have irregular shape and it is due to the coexistence of waves with different frequencies and directions. This type of wave is called sea wind. Once generated, it propagates outside of the generation region, including two dispersion mechanisms :

→ Radial dispersion: the longest periods travel faster and it reach the coast earlier and with more wave height than the shorter periods.

→ Angular dispersion: As the fetch width is finite, only certain directions could develop, affecting equally to all periods.

When swell that is already in the sea open, has gone through a sifting for periods and directions due to the previous two dispersal mechanisms, the crests become more rounded and the swell takes more regular appearance .

Waves move grouped in wave trains with equal wavelength and propagating velocity and towards the coast. This is called extended sea waves and it is fundamental in ocean coasts . However, it is less important in enclosed seas.

Both types of waves are affected when approaching the coast due to the interaction with the seabed. Three zones are distinguished depending on the depth to the bed (h) and wavelength (L):

•Deep-Water wave: wave propagates without interaction with the seabed, the speed of wave train (c) is independent of depth. The orbit that the particles described is circular type and meets the relationship

$$\frac{h}{L} > \frac{1}{2}$$

•Transitional wave: the waves begin to notice the seabed and the speed of the train waves becomes dependent on depth. This area is in the range

$$\frac{1}{25} < \frac{h}{L} < \frac{1}{2}$$

of the relative depth. The trajectory of the particles is elliptical.

•Shallow-water wave: water particles notice the near existence of the seabed. In the extreme case, the vertical movement will disappear, having a straight horizontal path. It holds that

$$\frac{1}{25} > \frac{h}{L}$$

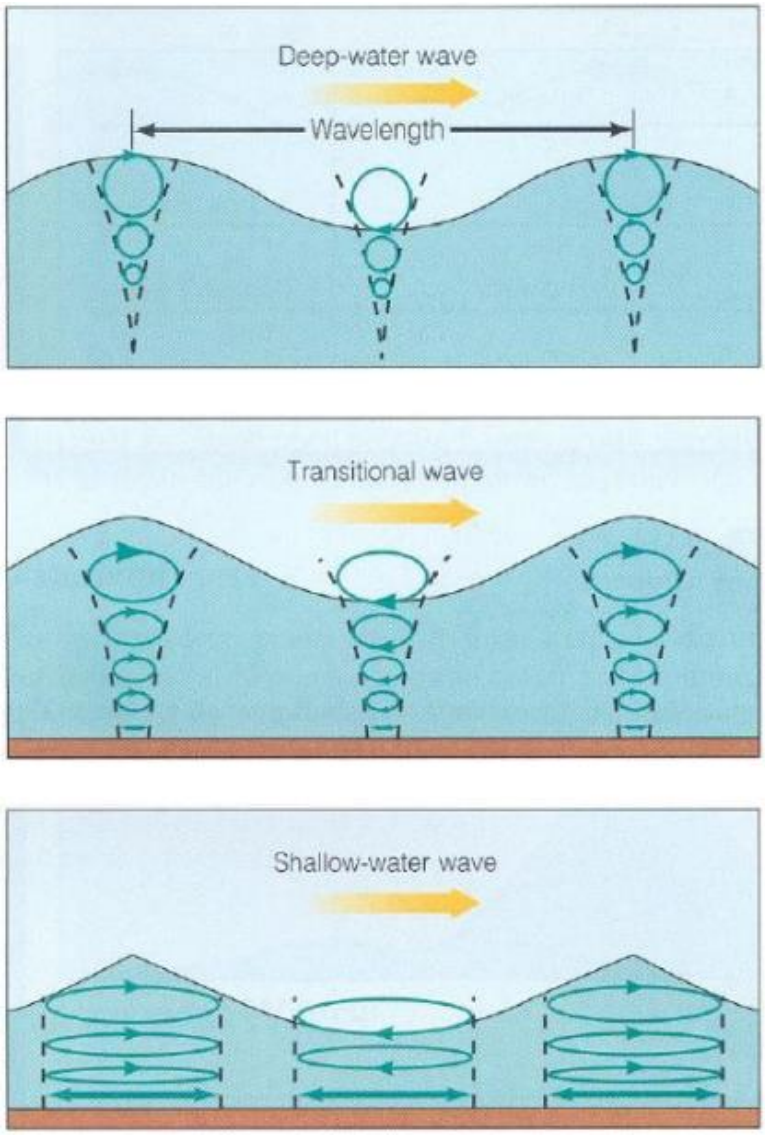


figure 25:Wave depth propagation (Vazquez Taboada, J. 2012)

As the relationship between height and wavelength (H / L) propagates towards the coast, it increases to a point where the wave becomes unstable and breaks. This process dispels tha energy quickly, such that must take into account the wave breaking when it comes to place a device. For elevations in the order of 1/50 or less, it is considered that the sine wave characteristics make possible the application of the theory of linear waves. However, for higher elevations 1/7, would work with non-linear theory since the waves would be in situation of breakage.

1.6. REAL SWELL

The real swell is a superposition of wave trains of different values of period and height resulting complex free surface records. The real swell is studied with two different techniques: using a statistical description of parameters or by using a spectral density function.

1.6.1. Geometric-statistical description

Involves the extraction of characteristic wave parameters from a series of free surface. In this thesis we will work with data from buoys located in deep waters. From these records, is taking the zero crossing criterion ascending (or descending) to consider separately each wave height and associated period.

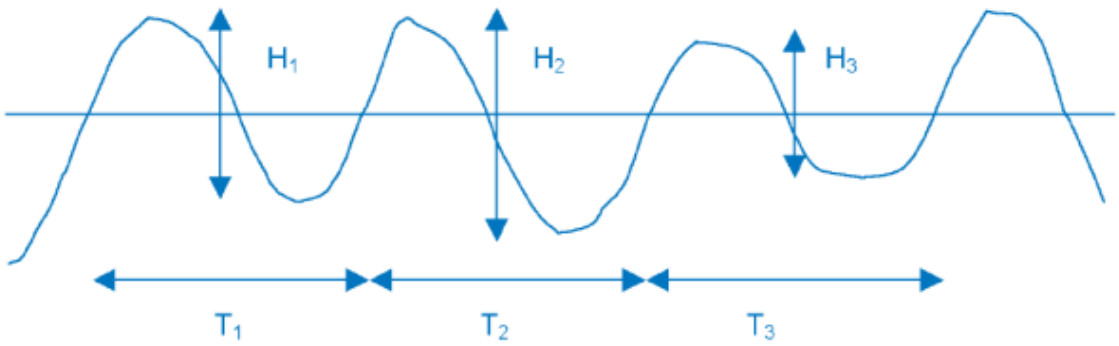


figure 26: Definition of wave height and period. [Internacional Energy Agency, 2003]

If we start with an example of wave record of limited time (30 minutes for sea states), are obatained N wave heights Hi, with Ti periods associated. Each Hi height will be maximum height variation of the free surface between two ascending zero crossings and Ti the elapsed time between these points. Once you have this information, the waves come characterized by a single value of wave height and period

that defines the state of the sea. The main statistical commonly used are the following:

Wave height

→ significant wave height (H_s or $H_{1/3}$): Arithmetic average of a third of the highest waves of the set of N waves of a given record.

→ Wave height $H_{1/10}$: Arithmetic average of the tenth of the highest waves. Is less frequent than the before one.

→ Square wave height (H_{rms}). Quadratic average of the record of wave heights. It is calculated as $H_{rms}^2 = \frac{\sum_{i=1}^{N} H_i^2}{N}$ and gives an idea of the energy contained in the record. It is used usually for calculating the energy per unit area as $E = \frac{1}{8}\rho g H_{rms}^2$

→ Maximum wave height (H_{MAX}): maximum wave height of the set of N records.

Period

→ Averaging period (T_z): Average period of the zero paths ascending or descending .

→ Significant period ($T_{1/3}$): Average of the periods associated with the third of the highest wave.

1.6.2. Spectral description

The sea surface is a complex superposition of waves with frequencies periods, wave heights and different directions. It can be interpreted as the superposition of many monochromatic waves of different amplitudes, periods, directions and phases.

The energy contained in each wave is proportional to the square of the height and period, and its distribution on the frequency waves can be represented in the form of power spectrum. This spectrum represents how energy is distributed in the different frequencies and is obtained by calculating the coefficients of the Fourier series. If it is a directional spectrum, this depends on three variables: amount of energy, frequency and direction.

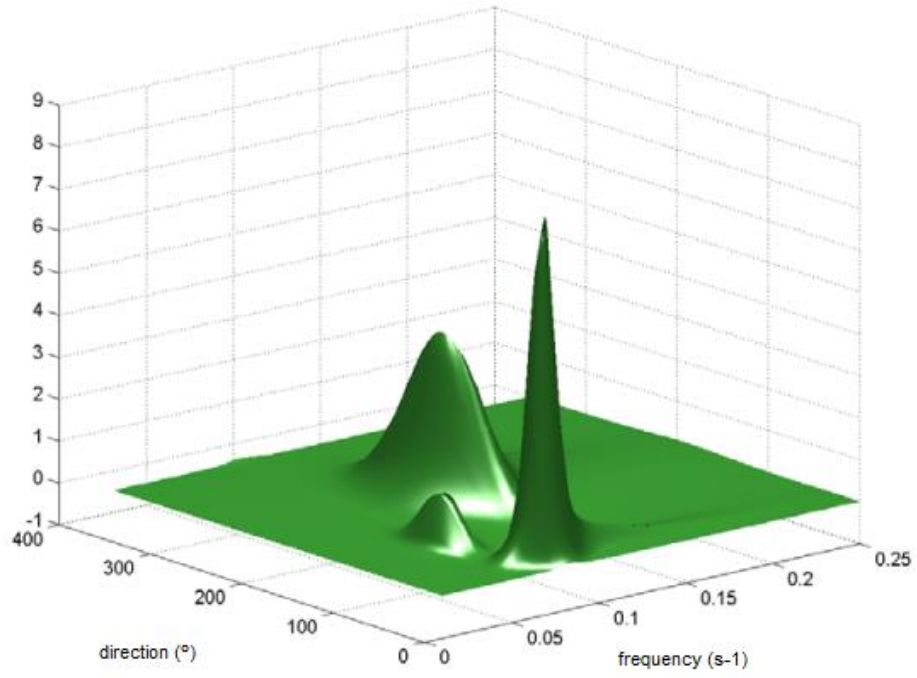


figure 27: Example of a composite spectrum of two types of swells; Type SWELL and type SEA. [Vidal Pascual, C. 2006]

A representation of the spectrum, besides allowing to see how the energy is distributed, represents the type of existing swell (SEA or SWELL) and peak values period as the inverse of the peak frequency. If you could determine the spectrum corresponding to a sea state, can be obtained from spectral moments (m_i) wave heights and periods.

Spectral moment of order i is defined as:

$$m_{(i)} = \int_0^{2\pi} \int_0^{\infty} \omega^i S(\omega, \theta) d\omega d\theta$$

Where: S ($\boldsymbol{\omega}$,θ) spectral density finction

ω^i, ith frequency

θ, direction

Significant wave height

$H_s = 4\sqrt{m_{(0)}}$ assuming that the distribution of wave heights are Rayleigh type.

Averaging period zero crossing

$$T_z = \sqrt{\frac{m_0}{m_2}}$$

Energy period (Te)

Period associated with a wave that contains all the energy of a state of sea. Arises from studies that relates the flow of wave energy, as relates the time since m_{-1} which depends on the lower frequencies of the spectrum, ie, with longer periods, to the time of zero order.

$$T_e = \sqrt{\frac{m_{-1}}{m_0}}$$

Average energy flow per meter width as expressing spectral moments. If we are in deep water:

$$\bar{F} = \frac{\rho g^2}{4\pi} m_{-1} = \frac{\rho g^2}{4\pi} \int_0^\infty \frac{s(\omega)}{\omega} d\omega$$

Solving the integral we obtain an expression of the type:

$$\bar{F} = \alpha\, H_s^2 T_p \quad [KW/m]$$

where α is a parameter whose value depends on the shape of the spectrum and is between 0.45 and 0.65. The value taken by α, will be conditioned by the period used in the formulation and the type of spectrum which is modeled.

El modelo espectrale de estados de mar más comun es el de Pierson-Moskowitz. Se presenta a continuacón en forma de resumen:

$$\bar{\mathrm{F}} = 0.549\ \mathrm{H_s^2 T_p} \quad [\mathrm{KW/m}]$$

1.7 CALCULOS

1.7.1. Annual energy production for a discrete number of wave states

The energy production is calculated for Hanstholm wave conditios. A selected number of annual wave states are considerer for this calculation i.e. the standardized wave states describing the energy content in the Danish seas in the period of one year (from 31/05/2013 to 31/05/2014). The data are facilitate by Danwec (Danish Wave Energy Center).

1.7.2. Followed methodology

The followed methodology has been firstly, group all the data obtained by Dan-WEC in an excel sheet, then use the excel to calculate the period average between height ranges of 0.5m. Once obatined these data, interpolate with Hanstholm-scale WEC power matrix in order to obatin the KW in each range multiplying them by the percentage of occurrence of each range that was previously calculated in excel spreadsheet. Finally, finally are sum all power with the percentage of occurrence already applied and this sum is the number of kilowatts that will be obtain, which can also multiply by 8760 to obtain the quantities in kilowatt hours produced by the WEC in a yea

Have	**Tave**	**Prob.**	**Pw [KW]**	**Prob*Pw [KW]**
0.0 - 0.5	4.48	0.01	5	0.05
0.5 - 1.0	3.67	0.18	19.5	3.51
1.0 - 1.5	4.01	0.22	33	7.26
1.5 - 2.0	4.30	0.18	58	10.44
2.0 - 2.5	4.57	0.12	70	8.4
2.5 - 3.0	4.85	0.09	100	9
3.0 - 3.5	5.02	0.06	103	6.18
3.5 - 4.0	5.23	0.04	103	4.12

4.0 - 4.5	5.40	0.02	103	2.06
4.5 - 5.0	Unavailable data	0.02	-	-
				TOTAL: 51 KW

Table 5: Total power obtained

The total power obtained in this period Pw= 51 KW.

This quantity have to be muultiplied by the number of hours in the year:

Total Power: Pw= 51KW x 24h x 365days = 446760 $\mathrm{KWh/year}$ ≅ **447 $\mathbf{MWh/year}$**

1.7.3. Capacity Factor

Capacity factor is a measure of how often an electric generator runs for a specific period of time. It indicates how much electricity a generator actually produces relative to the maximum it could produce at continuous full power operation during the same period.

On a platform of wave energy a capacity factor higher than 20% indicates that it is profitable to build a plant for energy extraction. The capacity factor is calculated by dividing the power plant gets in a year in relation to the power getting at their maximum performance. For this project, the rated power of 103kW pelamis is multiplied by the number of operating hours per year:

$$\mathrm{P_r} = 103\mathrm{KW} * 8760 = 902280\ \mathrm{KWh/year}$$

$$\mathrm{Cf} = \frac{447\ \mathrm{MWh/year}}{902\,\mathrm{MWh/year}} = 0.4955$$

The **capacity factor** obtained in the wave energy part would be ≈ **50%** which means that it have an excelent qualification to built.

1.8. PLATFORM IMPLEMENTATION

1.8.1. Identification and instalation selection

For the selection of study sites has to take into account the degree of wave exposure and the presence of obstacles generates areas of low wave height which are not recommended to install a platform of wave energy. Another consideration is the variation of the wave power in relatively small areas around a predetermined point, which induce phenomena such as refraction.

Another element to consider is the distance from our node spreading to the waterfront, which will vary according to geographical features.

1.8.2. Selection criteria for location

Besides of the potential of the waves and electrical variables that influence the costs of a wave power plant there are other criteria such as distance to coast lines, access roads, availability of construction machinery, availability of maritime and port services for installation and maintenance.

1.8.3. Location

Hasntholm location has been selected due to the several possitive reasons, although it also brings some limitations. On one hand, there are comprehensive data sets of simultaneous and co-located half-hourly forecast and buoy-measured wave data. In addition, there is an increasing interest on the characteristics at this particular location, since a new wave energy test site, i.e. DanWEC, Danish Wave Energy Centre is being developed. DanWEC is a test centre for wave energy converters (Figure 7). A 1:2 scale model of Wavestar and a 1:5 scale model of Dexa are currently deployed there. These prototype tests can complement the current study by providing actual power production data.

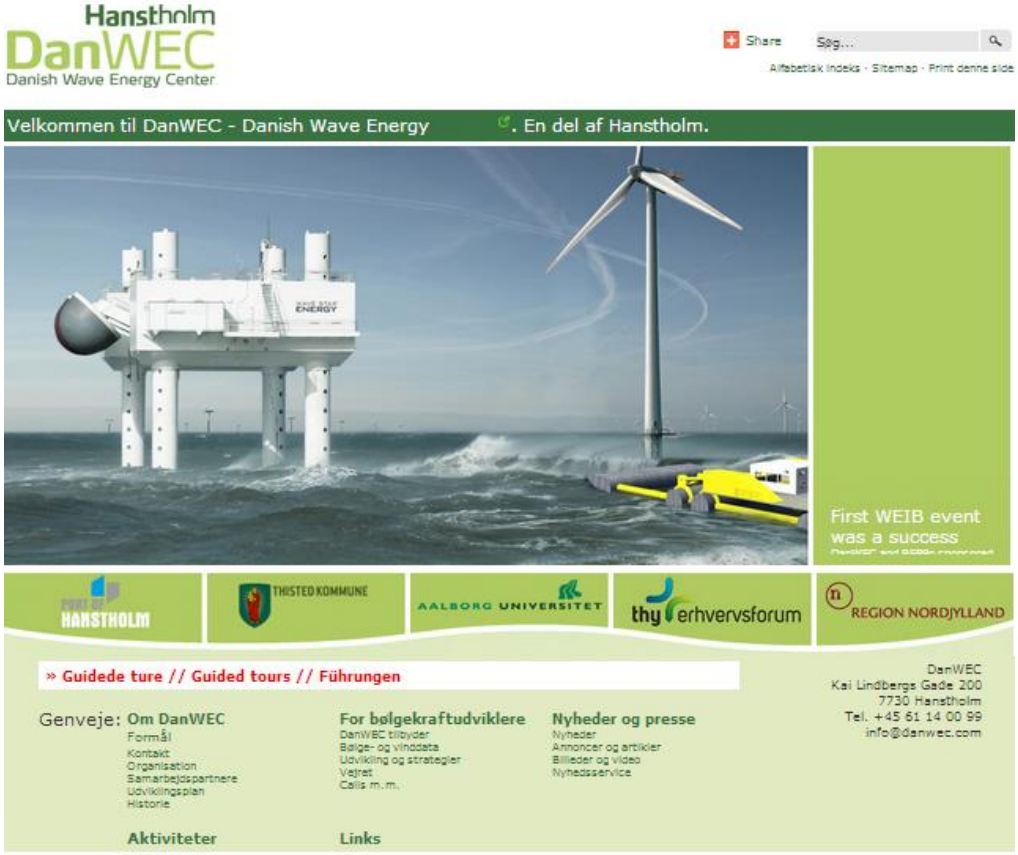


figure 28: DanWEC, Danish Wave Energy Centre

The wave energy potential at Hanstholm is limited compared to other interesting deployment sites. As well as, the wave climate of the North Sea is one of the shorter period waves in the Atlantic Ocean.

1.8.4. Study Location - Hanstholm

The selected research site is Hanstholm, at the west coast of Jutland, Denmark, in the Danish part of the North Sea. The mean energy flux is 6 kW/m at water depths of 12 to 30 meters, coming primarily from western direction.

The wave climate is characterized by a wind sea on top of a non-constant swell arriving from the northern part of the Atlantic Ocean. The buoy measures refers to a point approx. 1.3 km offshore and at 17 m water depth (coordinates 8.5821°E, 57.1315°N).

Data have been taken from the buoy measurement of Danwec.

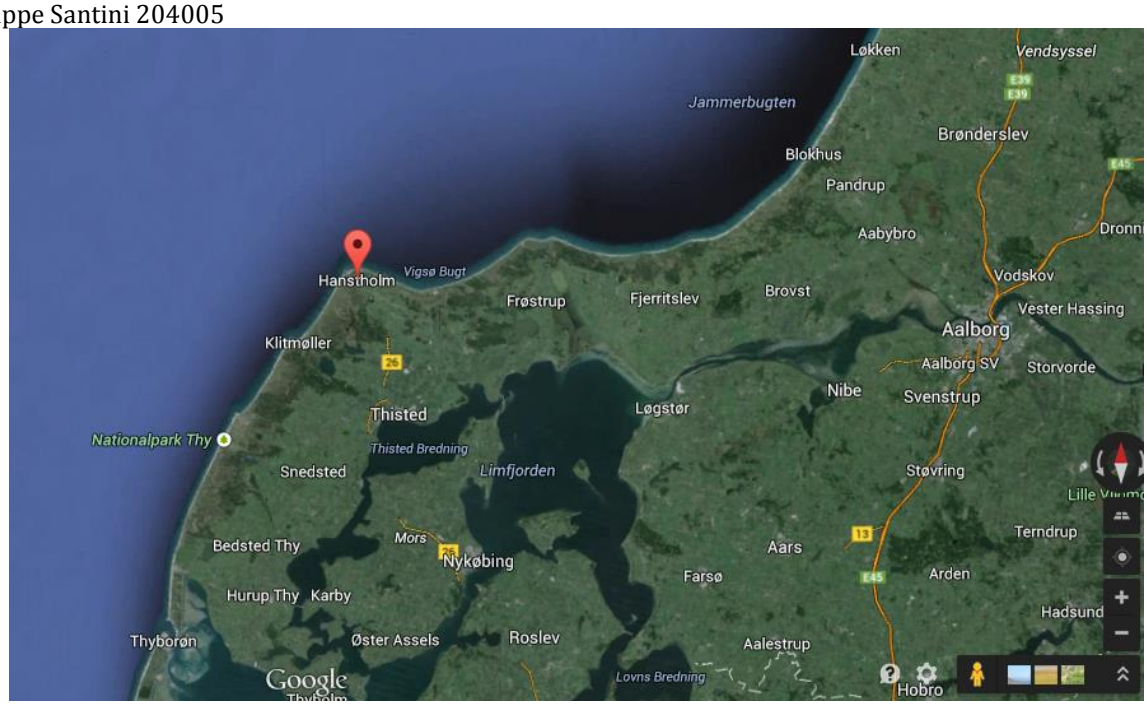


Figure 29: Location zoom at Hanstholm

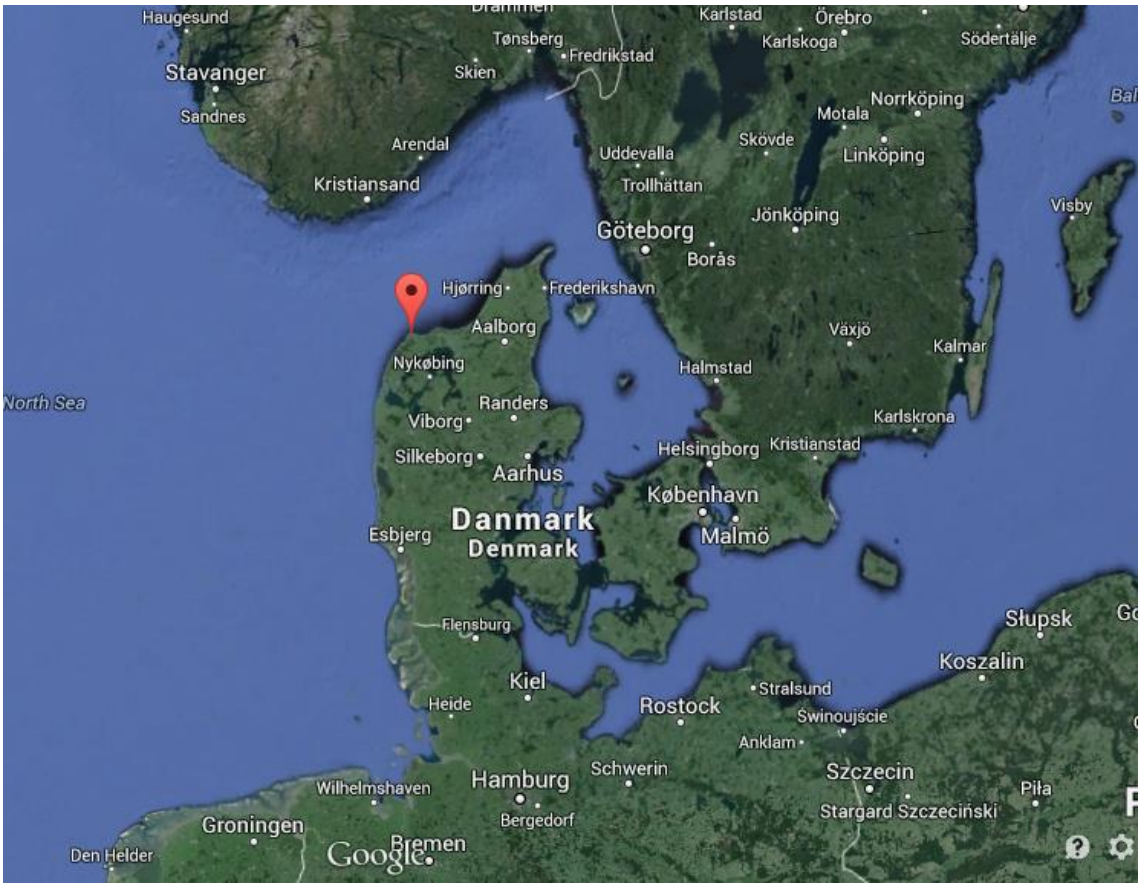


Figure 30: Location at Hanstholm

1.8.5. Platform location

Proximity to the coast.

As is recommended by the pelamis manufacturer, pelamis must be installed in a proximity from 5km to 10km to the coast and depths greater than 50m.

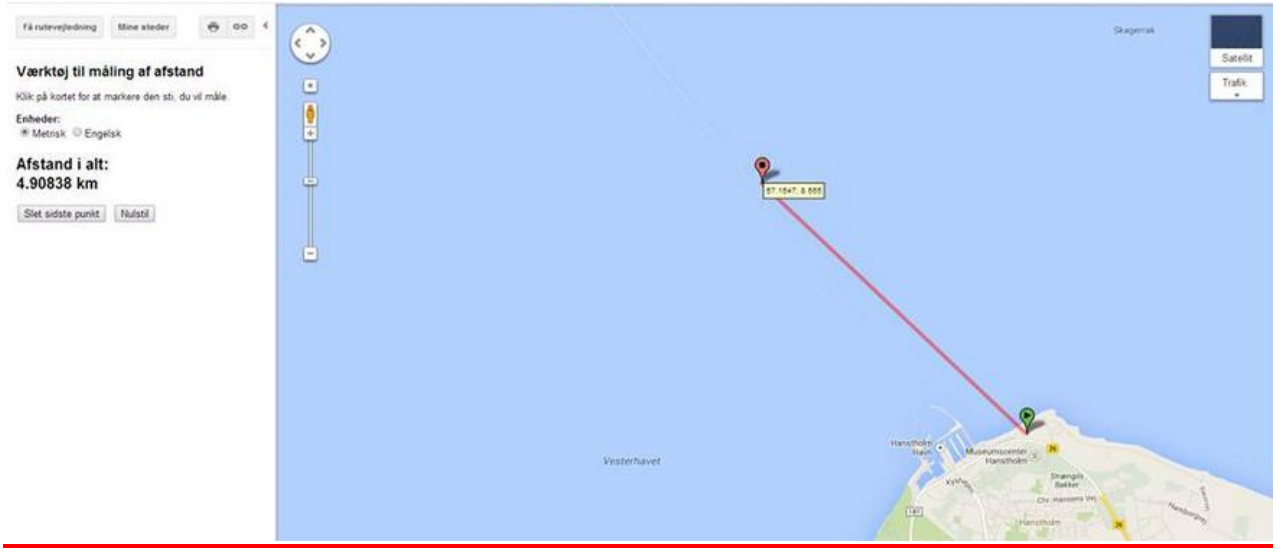


Figure 31: platform proximity to the coast. Google maps

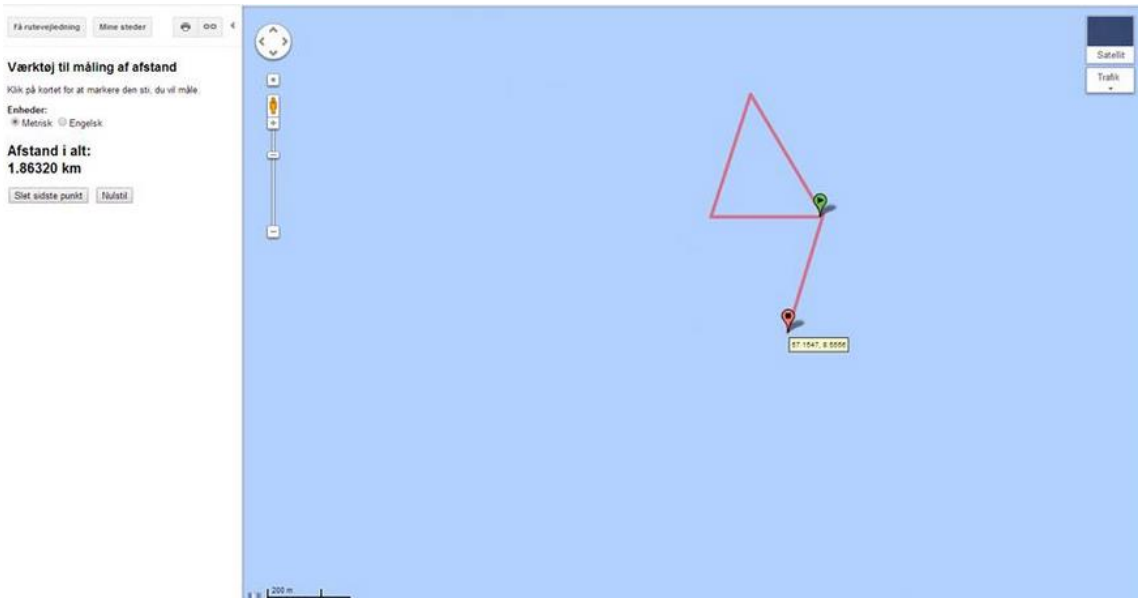


Figure 32: coordinates pelamis wave instalation. Google maps

In the each peak of the triangle shape are installed three wind turbines and next to them pelamis 6 at a distance of 800m is anchored in south west direction with the coordinates: 57.1547N 8.5555

2. WAVE TECHNOLOGY

2.1. Wave energy converters

Nowadays the renewable energy sector is on the rise because of the growing concern about dependence on fossil fuels and pollution they produce. They are all dependent somehow of subsidies from the state or the European Union aimed at this purpose. In a first stage in which this type of energy are not competitive the need for an organization to invest in further research and development of alternative energy is evident . Wave energy is a resource that currently presents many technological challenges to overcome.

2.2. Wave energy converters classification

They can be classified according to different criteria:

2.2.1. According to the relative position regarding the coast

- **Onshore:** on the coast
- **Nearshore:** near the coast (10-40m)
- **Offshore:** the Sea Inside (> 50m)

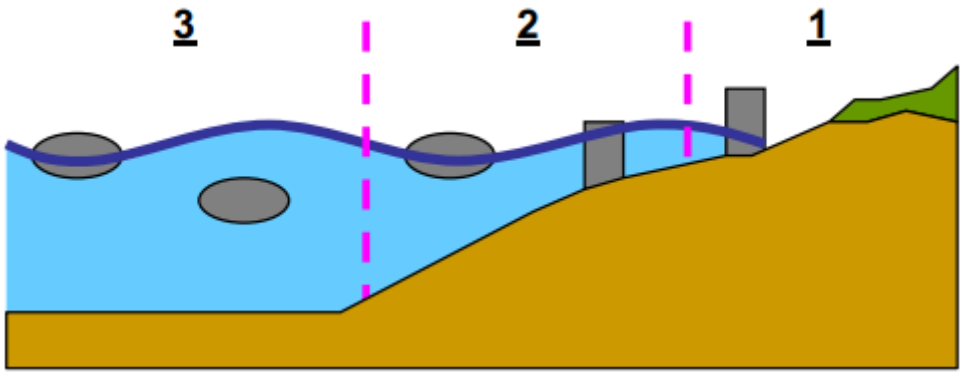


Figure 33: Clasificación wave energy converters

1 : Onshore: isolated or in dam shape.

2 : Nearshore: supported or floating bottom.

3 : Offshore: floating or submerged in bottom.

2.2.2. According to the orientation to swell and form.

- Attenuator

Attenuator parallel to the predominant wave direction and 'ride' the waves. An example of an attenuator WEC is the Pelamis, developed by Ocean Power Delivery (now known as Pelamis Wave Power) which is the one used in this research .

- Point absorbers or oscillating bodies

A point absorber is a device that possesses small dimensions relative to the incident wavelength. They can be floating structure that goes up and down on the surface of the water or submerged below the surface relying on pressure differential. Because of their small size, wave direction is not important for these devices. There are numerous examples of point absorbers, one of which is Ocean Power Technology's Powerbuoy.

- Terminator

Terminator devices have their principal axis parallel to the wave front (perpendicular to the predominant wave direction) and physically intercept waves. One example of a terminator type WEC is the Salter'sDuck, developed at the Unviersity of Edinburgh.

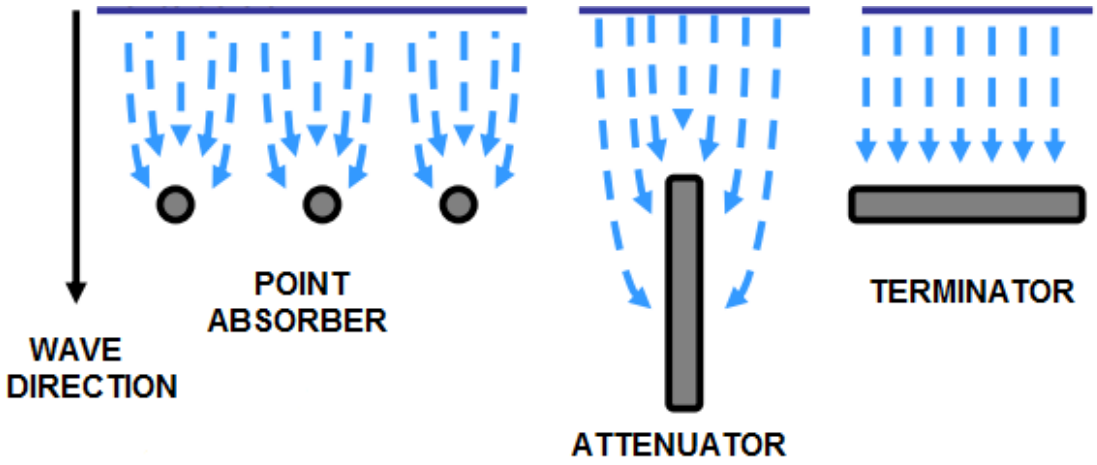


figure 34: WEC´s classification according to orientation

2.2.3.According to the principle of operation and energy capture:

There are two main groups:

- Passive or static systems: are those in which the structure is stationary throughout the whole process of conversion, so that the energy is produced only with the motion of the water particles. One example is the system TAPCHAN.

- Active or oscillating systems: take advantage of relative movement between the fixed and the mobile device.

There are two types:

- The swell acts directly on the moving body. The primary conversion is based on relative motion between two bodies.

- The swell acting on a water-air interface, such that the wave displaces the air, which at the same time moves the movable body.

The main types of WEC's are;

1) Oscillating water column: Water pressure is transmitted to the air, which at the same time drives the turbine.

2) Archimedes: is based on the relative motion between two bodies which pressurizes the fluid contained in the interior.

3) Fixed reference buoy: buoys that float freely with an anchorage that incorporates the energy extraction system.

4) Buoy body with moving reference: The energy is extracted by relative motion of the different parts of the structure.

5) Devices rebasing: can be floating or fixed to the seabed, which stored the incident water of the waves to drive a turbine. Therefore, they take advantage of the energy potential wave.

6) Pendulum impact device: take advantage of the horizontal wave energy to start up a piston which drives the turbine. They use a small amount incident kinetic energy.

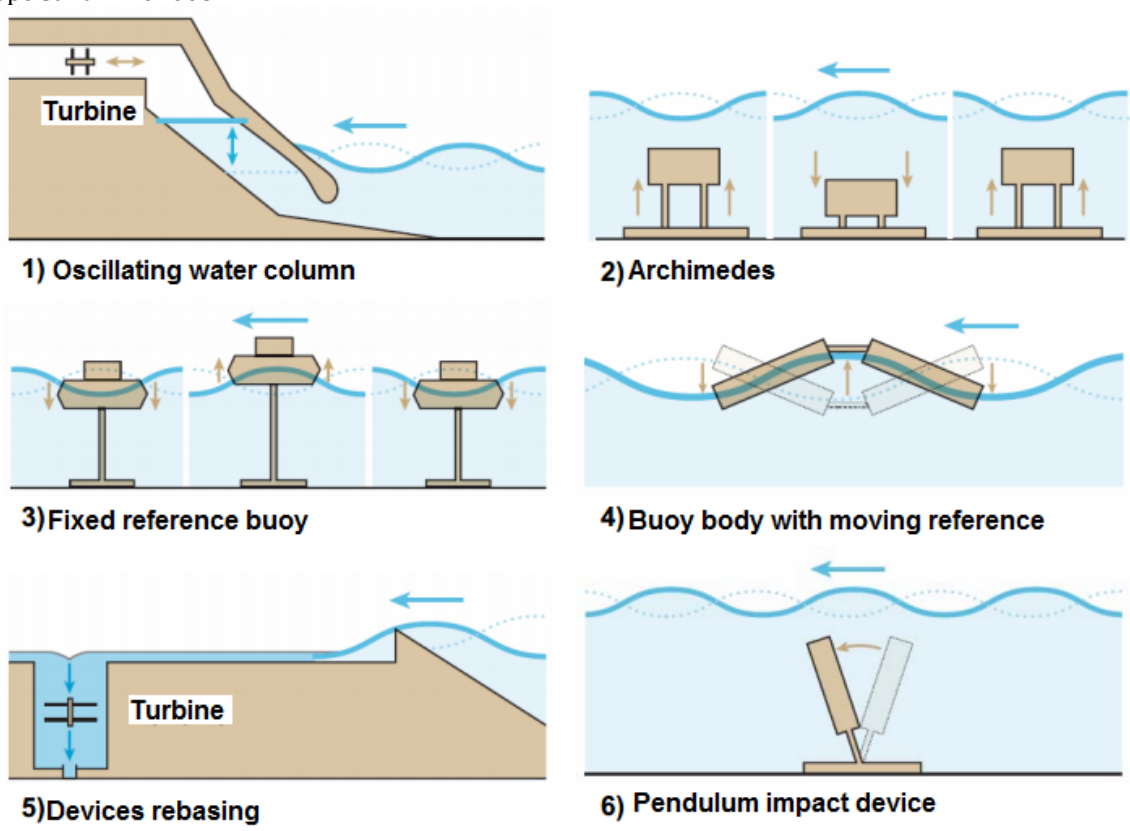


figure 35: main types of WEC´s

2.2.4. According to the use of the obtained energy:

- Electricity supply to the network.
- Desalination of seawater
- Pumping and water heating in fish farm.
- Cooling plants
- Etc

• **Other**: depending on the output power, size and capacity of the installation, development degree (research, scale ...), etc.

2.2.5. Selection of the most developed technologies

2.2.5.1. OWC (Oscillating water column).

An oscillating water column consist of a structure partially submerged and hollow at the bottom, inside which there is an air chamber below the sea level, it uses a large volume of moving water as a piston in a cylinder. Air is forced out of the column when a wave rises and fresh air is drawn in as the wave falls. This movement of air turns a turbine weir at the top of the column.

The turbine speed is maximum when the system is in resonance, that is when the natural frequency of the turbine and the generator coincide with the wave. Yields are typically 30-50% and can be installed on mobile or fixed structures or floating structures or on the solid rock taking advantage of the port installations. The power can operate between 100 and 500 KW.

2.2.5.2. LIMPET

The device was developed by the British company WaveGen Ltd. in December 2000 on the Isle of Islay in the west coast of Scotland, where there is a flow of energy available between 15 and 25 kW / m. Consist of two turbines type Wells each of which has a capacity of 250 kW installed. This device is connected to the network, has proven to be structurally resistant to extreme storm conditions with minimal maintenance and currently serves as an experimental basis to develop new technologies.

The device comprises three water columns contained within concrete tubes each measuring internally 6m by 6m and inclined at 40º to the horizontal giving a total water surface area of 169m2. The upper parts of the tubes are inter-connected and power conversion is via a single turbine generator unit located in the middle of the rear wall. The water columns with an external width of 21m are located 17m inland from the natural shoreline in a man-made recess with a water depth of 6m at mean water level. The sides of the recess are virtually parallel and vertical. The water depth reduces to 5m immediately to seaward of the gully. It has been optimized to reduce the visual impact and to have easy installation and maintenance.

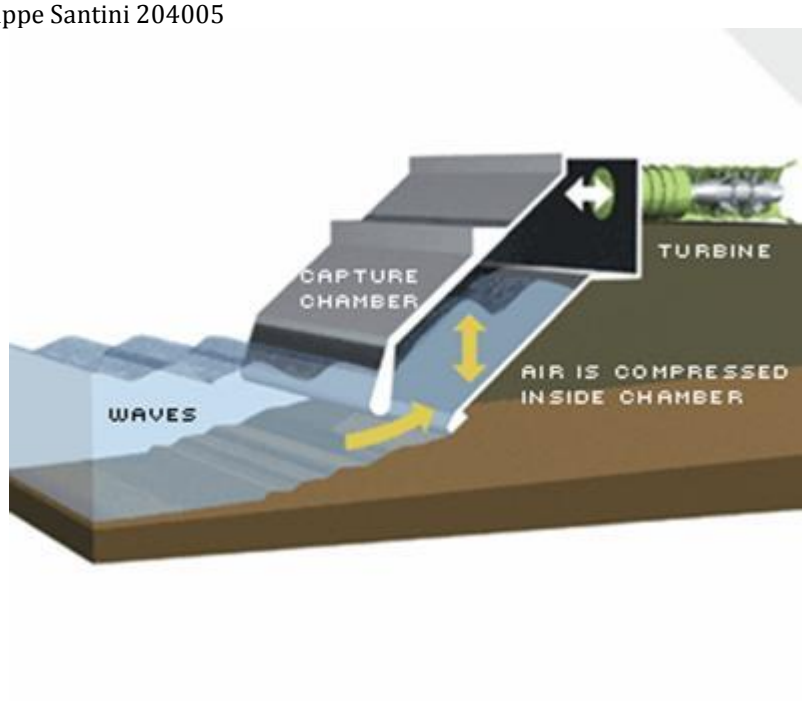


figure 36: Limpet

2.2.5.3. MUTRIKU

It is located in the town of Mutriku on the coast of Guipuzcoa , Basque Country, and was inaugurated on July 8, 2011. Their installation was the result of an attempt to solve the problem of accessibility to the port and take advantage of the opportunity of incorporating infrastructure harnessing wave energy, then once chosen technology, OWC , was hired the same company that created the LIMPET, WaveGen.

A study of wave propagation was performed at four different points, three in the trunk and besides attracting waves, their effect on wave reflections and also in terms of navigation assessed sea.

Of the four possible locations is reduced by two located in the trunk, one in the area of deep water had a poorer orientation facing the prevailing direction of the waves, while the other is located in a zone of reduced depth with a better orientation . Although the difference between the two locations was small, from the energy point of view, finally selected the second because the shocks are more dispersed, while the first was more concentrated disturbance located in the passage of vessel traffic .

The wave Mutriku plant consists of 16 cameras and in each group there is a turbo generator rated power 18.5 kW , and the total assembly power reaches 296 kW . The

turbogenerator has a Wells type turbine fixed pitch, offering robustness and simplicity, the blades are symmetrical, which allows, regardless of the air flow path in either direction, always rotate in the same direction. In this case, the two rotor turbine has five blades that rotate independently .

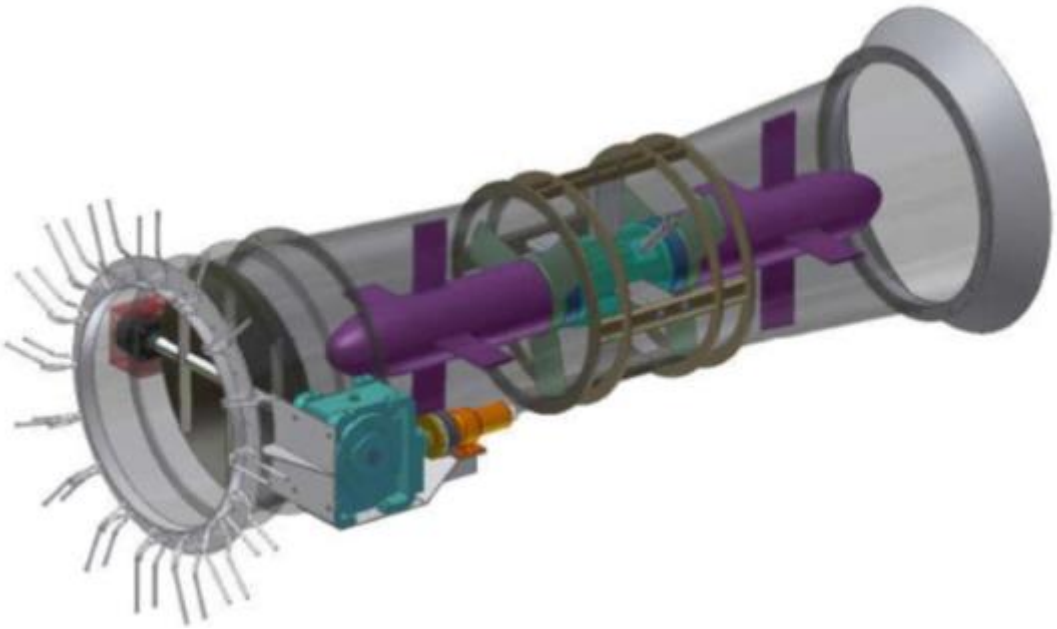


figure 37: 3d representation of a turbogenerator of wave Mutriku plant. (Ortubia)

2.2.5.4. OPT

The OPT buoys are developed by the American company , Ocean Power Technologies, they obtain energy from the relative motion between the float and the mast by hydraulic system and hydraulic actuators used to make the extracted power is constant over time. The energy conversion is that the vertical movement of the float will result in pumping the working fluid and also operate an electric generator. The electrical output is converted from low to medium voltage on the submarine substation.

Furthermore, there are other versions have similar performance, for example, the SeaRaser and AquaBuOY. The latter consists of a piston pump attached to the sea bottom with a float, that is, a piston attached to the buoy .

The Wavebob, developing in Ireland, is another two throbbing bodies device. Comprises two coaxial floats axisimètriques, the relative axial movements are converted into electric power through a high- pressure oil.

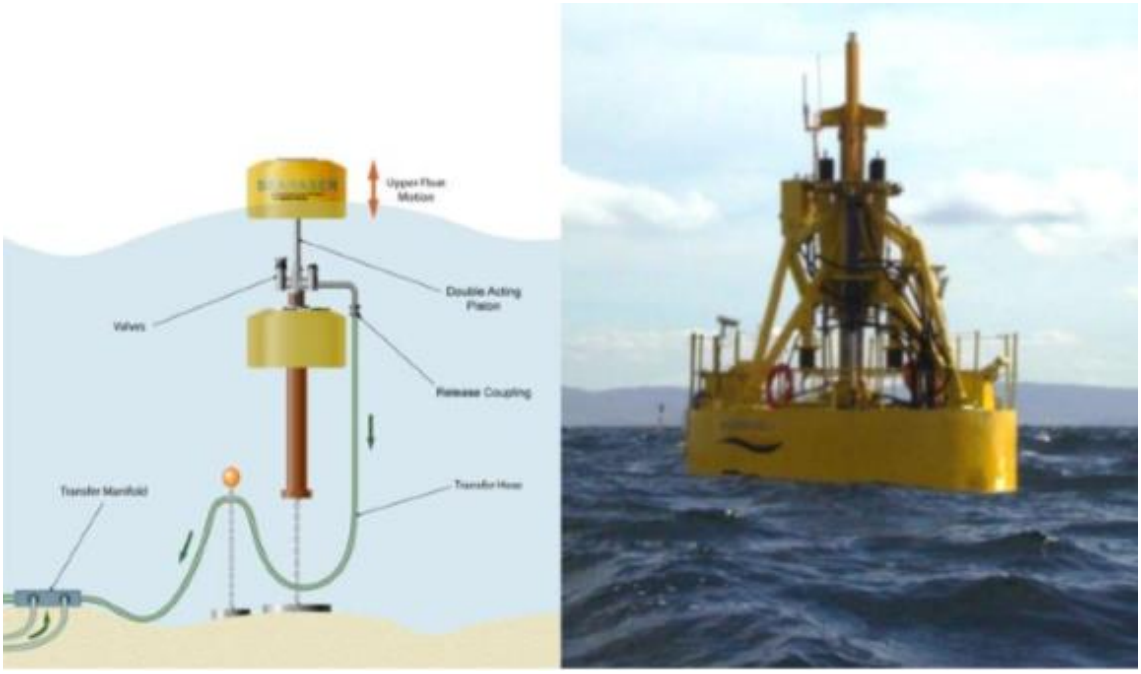


figure 38: OPT Buoy. (SeaRaser)

2.2.5.5 AWS

It is a feedback system fully submerged wave energy, developed mainly in the Netherlands. It may be located in the shallow waters but can also be placed in deep water, as is usually between 40 and 100 m deep. Consists of two cylinders, one is secured to the seabed and the other does float describing a vertical movement so that the relative movement between the float and the bottom fixed power is generated by a hydraulic system and a linear electric generator. The float is pushed down when a wave crest pass and recovered when a wave trough.

The first AWS was installed in Viana do Castelo, Portugal in 2004. It was a prototype consisting of 4 towers sinking when water is added. The maximum movement distance is of 7 meters with an average speed of 2.2 m / s. Currently, these large structures are replaced by others of smaller dimensions that allow to install several in a smaller area.

figure 39: AWS wave energy converters. www.maritimejournal.com

2.2.5.6. OYSTER

It is other almost completely submerged device that works with a rotary motion. This device is totalizator type because it is against the advance of the wave, formed by different cylinders placed horizontally with hinges attached to the seabed at depths between 10 and 15 meters, about half kilo meter from the coast to avoid the severe storms that originate most commonly in the high seas. Therefore, it is a device for near-shore type.

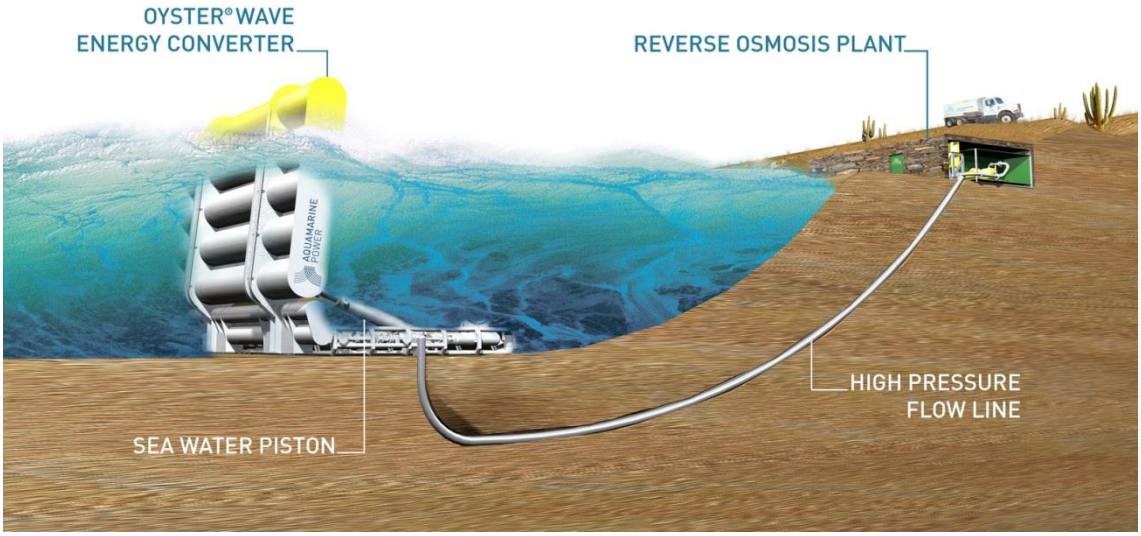


figure 40: OYSTER. Aqua Marine Power

2.2.5.7 Wave Dragon

figure 41: Wave dragon

It is a device that harnesses the potential energy conversion by the overflow of water from the outside inward. It was developed by the Danish company Wave Dragon Ltd. system.

The Wave Dragon is moored in deep water, preferably at a depth of over 40 m to take advantage of the waves at sea. Moreover, it is a floating device that is designed to remain motionless and is built with outdoor cameras where there is an air pressure regulating floating height as the wave height as efficient overflow ramp.

This device uses the principles of traditional hydroelectric plants on a floating platform. The Wave Dragon comprises two wave reflectors which direct the waves towards a ramp which serves a large dip water storage site located above sea level. The water goes through a hydraulic turbine kaplan type as the height difference between the upper level and the sea does not exceed 3 m .

Water turbines have a water inlet siphon and rotating at low variable speed generators are coupled to permanent magnets.

The Wave Dragon ramp can be compared to a beach in the sense that when the wave reaches the beach changes its nature. The Wave Dragon ramp is very short

and steep to minimize the energy loss that occurs whenever a wave reaches the ramp.

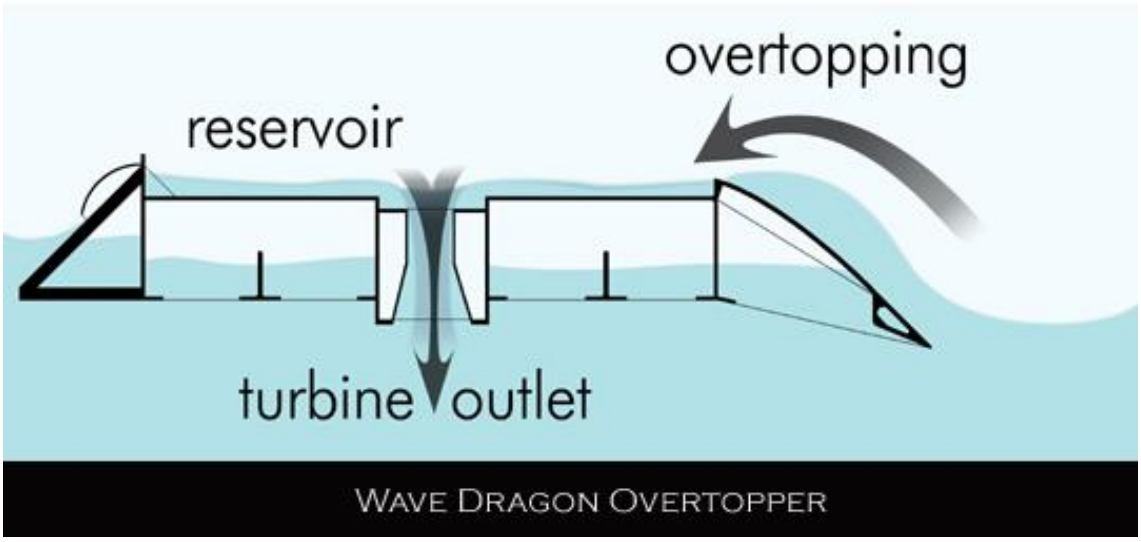


figure 42: Wave dragon overtopper.

There is a prototype located in Bredning Nissum , Denmark, for a wave energy power 0.4 kW / m. The main body consists of a large floating device to reduce roll and to maintain a stable platform. This part of the device is made of steel with a thickness of 8 mm and reaches a global weight along the ramp, of 150 tons, which must be added the volume of water that can store up to about 55 m3 of seawater equivalent to approximately 87 tons . With a total weight of 237 tons. The reflectors of this prototype are 27 m long, 3.5 tall and weigh 25 tons.

2.2.5.8. PELAMIS

- Characteristics

The Pelamis is one of the most advanced devices, was an invention of Richard Yemma, and its name comes from the Greek meaning " sea serpent ". This technology was developed by a Scottish company Ocean Power Delivery , which was later called Pelamis Wave Power because the success of this device.Its operating principle is the waves cause the movement of joints of the device, which drive a hydraulic system coupled to an electric generator .

The device consists of a cylindrical structure of between 3 and 5 modules, semi submerged and oriented parallel to the direction of wave propagation. The modules are fastened at various points so that allow vertical and horizontal movement .

Each module has a nominal power of 250 kW , and a whole provides a minimum power of 750 kW.

Its particular shape, long and slender, is designed to withstand the worst conditions climatologies. This type of device has been designed to be located at a distance between 5 and 10 km from the coast at a depth of between 50 and 70 m .

Each has its own Pelamis mooring structure, formed by a number of anchors, designed such that the footprint is minimized, allowing a high concentration of power and a reduction in infrastructure costs.

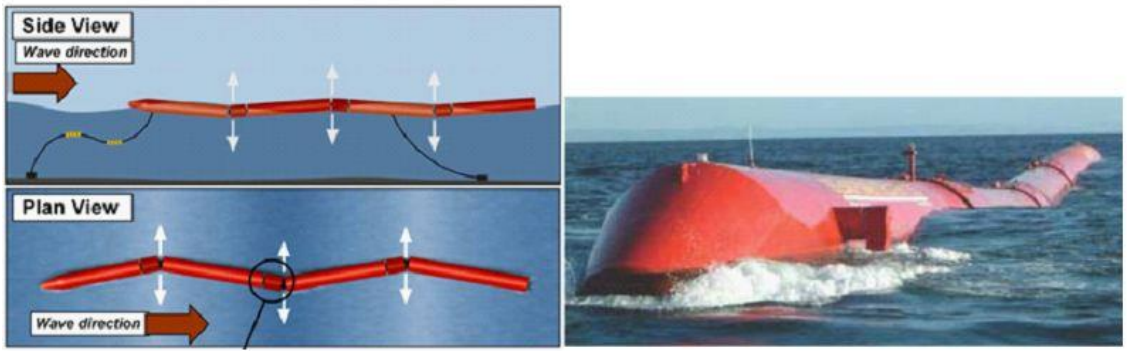


figure 43: Pelamis movement representation.

- Design Tools

The Pelamis has been optimized using custom software to simulate hydrodynamics and overall system dynamics. The models were done in frequency and time domain and correspond very well with measured results. A total of 14-wave tank test programs were carried out to assess, validate and optimize the device for power capture, survivability and mooring requirements. The tests were carried out at 1:80, 1:35, 1:33, and 1:20 scale.

- Technical Issues

Structural Elements

The structure is of steel and can be built locally. The device structure has been designed using standard offshore construction and a leading offshore technology-consulting firm independently verified the design.

Power Take Off

Each hinge of the device contains its own hydraulic power take off. Each power take off contains a total of 3 hydraulic rams, which convert the motions into hydraulic pressure. Using accumulators and two 125kW generator sets, the hydraulic power is generating electricity. The hinges and power conversion mechanism have undergone full scale testing on a test-rig and have been integrated into the full-scale device. The hydraulic systems use biodegradable hydraulic fluids, which complies with the German 'Blue Angel' Environmental standard.

- Mooring

The mooring consists of a 3-point slack-mooring configuration. The mooring allows the device to turn into wave direction within its mooring constraints. The mooring and survivability of the system has been simulated theoretically and tested in wave tanks. While the mooring is probably the least mature element in the overall system and will need to be looked frequency and adapted to the specific site requirements, it does not raise any concerns. The mooring and survivability has been independently analyzed and verified by one of the leading offshore technology consultancy firms and is designed to withstand the 100-year storm wave.

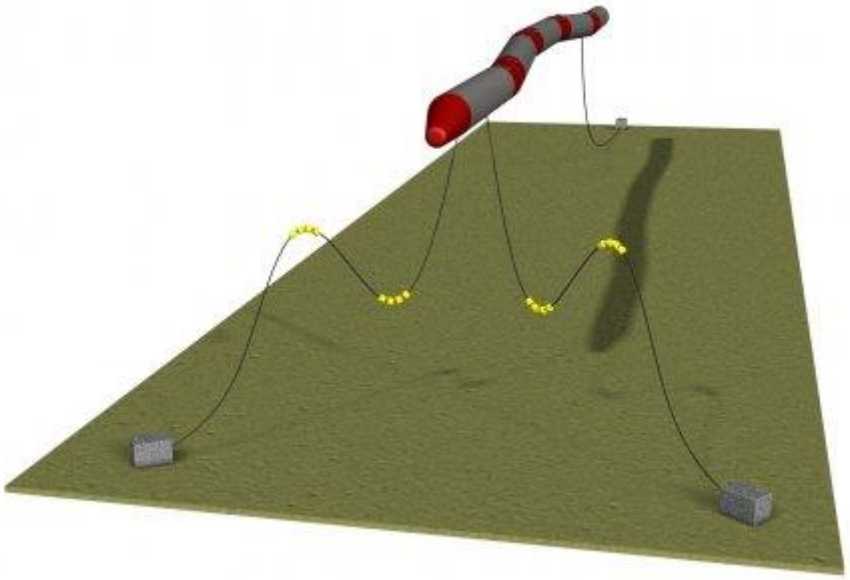


figure 44: Pelamis anchoring system. www.oceanrenewableenergy.com

- Survivability / Failure Modes

The Pelamis has excellent survivability characteristics. Being a relatively narrow device, which will point into the wave and is able to completely detune to large waves, it will always minimize loads on its mooring system. The power take off and control subsystems have been designed with many redundancies in place to minimize reactive maintenance such as the required intervention after a storm.

- Grid Integration

The device features a frequency converter and an on-board step-up transformer. As such, it is able to completely synchronize with the wave farm transmission voltage. A flexible riser cable connects the surface device to a junction box sitting on the ocean floor.

- Performance / Tuneability

The device is able to rapidly tune to the incident wave climate using it's digital controlled hydraulic system and detune to over-sized waves. A large amount of effort has gone into optimizing the devices tuning and associated efficiency. The hydraulic

power conversion train has an average efficiency of 80% and future versions will likely show improvements in conversion efficiencies.

- Operation & Maintenance

Device maintenance will be carried out at pier- side. The device is designed to be quickly disconnected from its mooring and towed into a nearby port for maintenance overhauls. Many subsystems, such as power modules, are designed in such a way that they can be lifted out with a crane and replaced with a tested subsystem. Remote diagnostic capability, extensive instrumentation and a high level of redundancy will minimize the physical intervention requirements and will allow O&M activities to be carried out during suitable weather windows.

- Deployment & Recovery

The device is designed with quick deployment and recovery in mind. The power and three mooring connections can be quickly disconnected from a tug, the devices nose attached to a special harness and towing can begin. This approach requires a minimal amount of time spent offshore and will reduce the weather windows required to deploy or recover the device. The slender and long steel structure, will allow for a simple towing-operation using a single handler tug. The devices tow-ability and handling has been tested at full scale.

3. ECONOMIC ANALYSIS

3.1. Influencing factors

Changes in the **initial design**. You may need to change the device radical in the collection system or the type of materials used. In the case of the present project the wave converter characteristics have had to adapt to the conditions that are given in the location where will be installed the energy production plant. Due to the fact that in the North Sea the weather conditions of wave energy are less than in the Atlantic Sea (where pelamis device has been designed) the study of the power obtained has been done with the energy matrix of a 1.25 scale of the real pelamis, with a rated power of 103 KW, thus optimizing the whole potential of the North Sea.

Location choice according to the **distance to shore**:

Related to the cost of :submarine cable , moorings and distance that the boats must traverse to get there. In offshore structural risk factor devices increases costs.

Location choice **according to the potential**: It seems obvious that would be more feasible to install a WEC in a place where exist greatest potential available than in a place less favored . However, what seems reasonable in theory in reality is not so clear. In a site with very extreme maritime climate the risk of structural damage is high and the device would not be able to cover the whole range of heights and periods. Therefore sometimes are given cases where although the location is not the best in the area, the functionality will be.

Location **where maintenance operations are performed**: onshore or offshore. In offshore the maintenance time is low and can be accessed by a small boat, while to transport the entire device would require further bigger infrastructure. The access of personnel to repair the device is very unconfortable by sea and is conditioned by the sea state. On the coast the repair and maintenance is possibly more effective as it can be done in a more comprehensive way .

Type of **vessels required** for the inspection, maintenance and replacement and whether they are proper, in the case of a wave park, or rented. It represent a cost to consider.

Changes in the **device size**. For some devices increases the energy extracted by increasing device size. However, for others, as in the case of this project, a size increase implies a decrease in efficiency, leaving the structural cost too high to make the project profitable.

Changes in **calibration generator**. If it is too high the generator will absorb small amounts of energy and it would be inefficient, whereas if calibrated very low it will not be able to capture the energy and extreme wave conditions. It will be important to maintain a balance in order to the device generates continuously reasonable amount electricity.

Wave farm platform. Some technologies are placed such that platform contains all the mechanisms of wave energy capture, so that they can be located in a farm wave independently. In other platforms are possible the alternative of sharing between several units of renewable energies, like a wave and wind platform, more attractive from an economic standpoint . Moreover, it is interesting to evaluate which is more feasible if a larger number of smaller devices.

3.2. Cost of selected technology

The main problem that has arisen when making this section has been the lack of corroborated information to check. Because this study was done based on a scale device adapted to the conditions of the waves of the location where will be installed and neither has experienced of offshore devices at this scale previously, it is impossible to know with certainty the costs associated. However, pelamis, installation and study costs associated are grouped into ranges thanks to the data collected. This data are given by two sources: EPRI and APPA.

3.2.3. Electric Power Research Institute [EPRI] .

Nonprofit organization leader in research and development in the field of producing electrical energy. Despite of to be an American company, receives international support. One of the affiliates companies is Electricity Innovation Institute, with which it has conducted studies on the wave energy potential and of patents in the world market. It has used the reports published by such organizations.

On the study Offshore Wave Energy Conversion Devices, EPRI are investigated more advanced devices in deep water with the aim to offer a breakdown of the specific operation of each, proven efficiencies and cost provided by the manufacturers . All of this with the purpose of providing the operation for four specific locations in the United States : Maine, Oregon, Washington, and Hawaii.

From each of the eight studied technologies a section cost is included in the which contains the capital of each device cost provided by the manufacturer. However, this value does not cover the cost of developing the project in a particular location, the infrastructure needed to make it operational, wiring underwater network connection and moorings.

In the present project the selected offshore wave converter is the Pelamis produced by the company Pelamis Wave Power.

3.2.3.1. Pelamis

Pelamis Wave Power gives an approximate cost of a single Pelamis device of 2 to 3 million dolars, equivalent to between 1,750,000€ and 2,630,000€. This value does not include the mooring.

3.2.4. Association of producers of primary energy [APPA].

The Association of Renewable Energy Producers includes companies that operate in the field of renewable energy and help create favorable conditions to development. The companies that includes are among others:

HIDROFLOT, SL

IBERDROLA ENERGIAS RENOVABLES, SAU

ROBOTIKER-TECNALIA

SEA ENERGY, S.A.

- Calculation assumptions.

- Lifetime plant: between 15 and 30 years

Is established with reference to the criteria of calculating naval offshore structures because there are no more information.

- Available wave energy device

Limited by the distance to save between the devices and energetic performance. The utilization factor of the energy available (product between the factor and the energy efficiency of devices) ranges from 6-8%.

- Meters wavefront

Usually between 40 and 200 m for plants up to 2 MW. Can be estimated as the sum of the diameter of the set of several individual devices.

- Utilization factor of available energy, performance and availability device

The percentage of kinetic energy extracted from the wave around 10 to 50% depending on each device. The plant is sized to have a performance of between 20-50%. Device availability is the percentage of operating time when you subtract the amount of scheduled shutdowns for maintenance and fault regarding to the total operating time 8760 hours / year . The EPRI in "Design, Performance and Cost" calcu-

lated an availability of 85% for prototype systems and 95% for the device commercial.

- Basic engineering, previous studies, project development, direction and coordination.

The associated cost usually ranges between 500,000 € and 2,000,000€ depending on each location and the plant size and chosen technology.

- Infrastructure.

Between 1,000,000€ and 6,000,000€ depending on:

Medium voltage submarine cables and protection thereof.

Civil works facilities placed at the edge of the sea.

Cost substation.

Cost ground connection .

Cost control center.

- Installation and mounting electrical infrastructure.

Between 500,000 € 2,000,000 € it includes transport by sea and land and machinery necessary.

- Installation and assembly of power conversion system and anchoring system

Between 1,000,000€ and 2,500,000€ depending on each technology.

Patricia Zurano-Perez 206113
Irene Salinas 203955
Agustin Mesa Lombardo 206063
Jean-Philippe Santini 204005
Jean-Philippe Santini

BUSINESS PART

Jean-Philippe Santini 204005

Irene Salinas 203955

Coordinator: Peter Harboe

Number of characters : 143 695

Patricia Zurano-Perez 206113
Irene Salinas 203955
Agustin Mesa Lombardo 206063
Jean-Philippe Santini 204005

Irene: The Market of Energy, Marketing Plan and Spanish Questionnaire.

Jean-Philippe: Competitors Analysis, Customer Analysis, French Questionnaire, Financial Data and Forecast.

Executive Summary

The following project is the result of all the efforts made by the group in this semester, to accomplish a successful result for the problem proposed at the beginning of the period. The project topic arises from the current environmental issues and the envy of people to choose their energy and by this way choose to pollute or not. Moreover according to our market reasearches, the demand of renewable energies is increasing every year and more consumer as companies as individuals are willing to use electricity from green sources, the green electricity market is still in launch in France and only a few companies offer energy from renewables, which opens the possibility to enter in the market.

. Renewable energies and green is an alternative for those who want to consumme electricity without influence the enivronment. Our idea is to develop a Marketing Plan to sell green electricity to companies.

On the market there is now what we called "incumbent suppliers" that is to say those witch had the monopoly of state to provide electricity and gas throughout France for more than 50 years, EDF and GDF were the only ones in this market . Since 2007, the market was opened to competition and alternative suppliers are now present in the market. Each has created its own strategy, Direct Energy, for example, positioned its offering as low cost, EDF providing quality services and playing on the reliability of its offer, Enercoop is the eco-responsible company that offers green energy, which is much more expensive than traditional energy. However, the market competition is very unbalanced incumbent suppliers are very powerful, they have a lot of customers a strong brand image and an experience that none other competitor has in the market nowadays.

Companies are shared between those which are really interrested by the process for reasons of ecology and some which find a marketing interest. Other companies are not at all interested about green electricity they say that it is too expensive, too risky or that it has no financial interest for them. Generally the most interrested companies are companies that have a business relationship with the environment, especially the agricultural and agribusiness, these companies are willing to spend more for green electricity. Many companies believe that they would use green energy if the state would subsidize the price

to reduce the cost for companies. Most often the director is the one who makes the decision to change supplier.

Thanks to the information that we have collected, we determined a marketing plan aimed at creating a business providing green energy, which can find a marketing positioning in the still small market for green electricity in France.

We offer a different option than our competitors, we propose green energy but with additional services both online and offline such as smartphone app or online invoice that differentiate us from our competitors. We will create a brand universe through our communication plan that will be developed by concrete actions such as visiting potential customers, calling companies and through our website. We will split our communication strategy into two flows considering the decision-making process of the companies.

Then, the essential element to determine is how many customers we would need to match with our energy production in order not to lose money and not waste electricity, so we calculated that we would need 5074 customers to sell all our production, we decided to achieve this in 4 years thanks to the help of 4 commercial agents, an e-commerce site and a phoning campaign. Then we quantify the cost of this customer increasing campaign to determine if it's going to be profitable, and if our company wil have profit, indeed our marketing plan would be pointless if our business is not financially viable. But since it will take 48 months to win the entire customer that we need, we will sell the unsold surplus of electricity on the market EPEX SPOT stock exchange, so as to reduce the financial losses to a minimum. We calculated that the company achieves turnover increases every year to stabilize it at the beginning of year 5 when the client objective will be achieved; the company also realize profits continuously. Our goal, has been to study the market, set the demand and supply and taken inspiration from these elements to achieve our own strategy then we calculated whether this strategy is profitable, our goal it is therefore achieved.

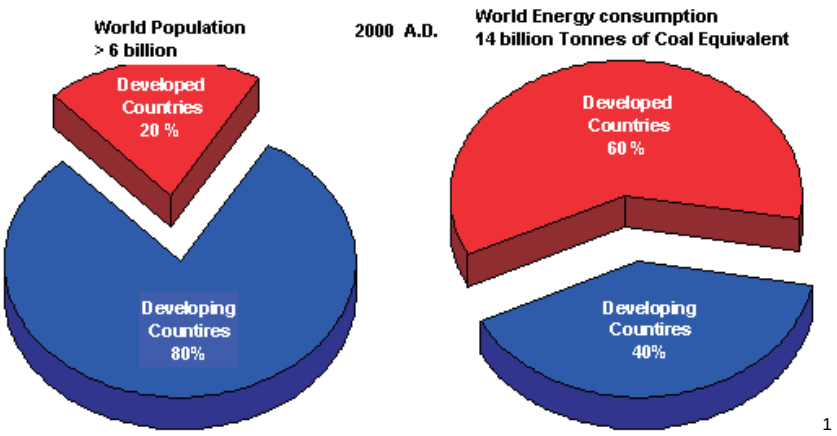
Patricia Zurano-Perez 206113
Irene Salinas 203955
Agustin Mesa Lombardo 206063
Jean-Philippe Santini 204005

MARKET OF ENERGY

Market of energy in the world

Developed countries have 20% of the world's population but consume 60% of global commercial energy. Energy consumption rises with the population and living standards, that's why awareness about environmental costs and energy needs is increasing day by day.

Chart 1 World energy consumption by developed and developing countries



[1]

Chart 2 World energy consumption by developed and developing countries

There are many tangible and intangible costs derived from fusel fuels energy; of course environmental costs like climatic change but also health costs (from pollution). The need of energy increases every year and governments are looking for new ways to procuce energy; all this aspects are taking renewable energy to the center of attention. The world is facing a new era where renewables energies are supported by governments, organizations, industry and nongovernmental organizations that promote and invest in different renewable energy studies and international events. Be-

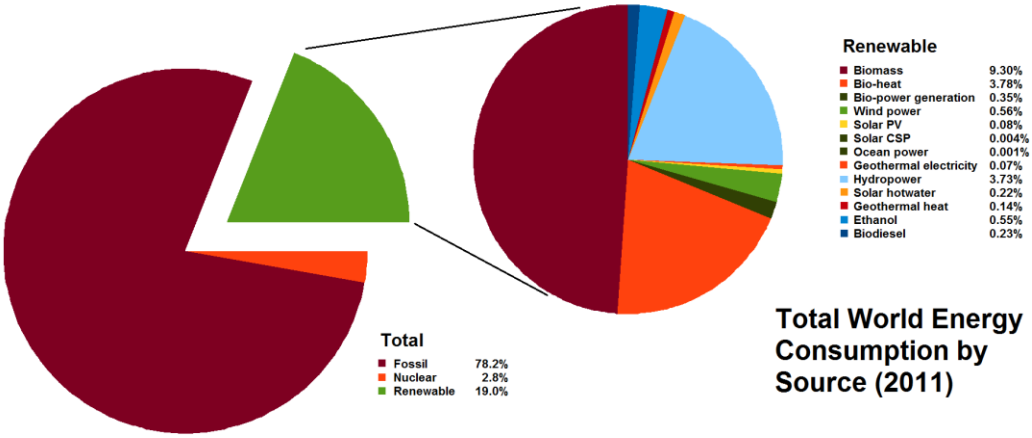
[1] http://www.theworldreporter.com/2010/05/energy-crisis-and-environmental-issues.html

sides, renewable energy market is expanding and new private companies are working in the development of new ideas.

The creation of companies dedicated to renewable energy make possible to talk about a market in renewable energies; where in the past years only governments invested in this kind of energy and it was just a matter of technology, now the market is opened to private companies, stakeholders, investors, individual households, communities, entrepreneurs, banks…

There are now some electric companies that propose 100% of their energy from renewable sources.

In 2011 fossil fuels were the source of energy most used worldwide (78.2%) and renewable energies were in the second place (19%) including biomass (9.3%) as the main source but also others as solar, wind (0.56%), geothermal or ocean power (0.001%). There we can see solar has an important and increasing share of the total consumption and ocean power is still testimonial but is supposed to increase in the following years.



[2]

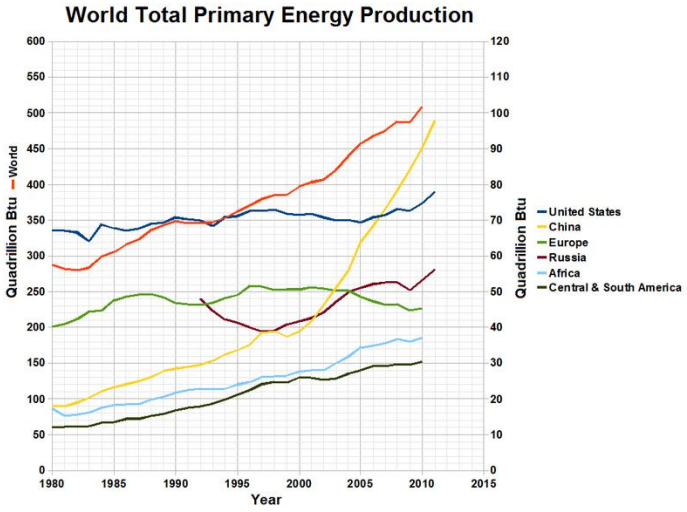
Chart 3 Total world energy consumption by source

The demand of fossil fuels in developed countries is not varying, but in the developing countries is expected to grow until it reaches 49% by 2018, which is going to be a problem due to fossil fuels are a limited source and also, they pollute a lot.[3]

[2] http://commons.wikimedia.org/wiki/File:Total_World_Energy_Consumption_by_Source_2011.png

Renewable energies are nowadays a demonstrated and reliable way of obtaining energy that make the number of installations grow every year. The technology has been the most important issue for the building of those plants but market and finance are currently increasing their importance. In this days the installations are not built as a study but as a reliable energy resource built upon many studies and demonstrations.

In the graph below we can see the primary energy producers where Europe is below China, US and Russia, that's why EU usually imports energy.

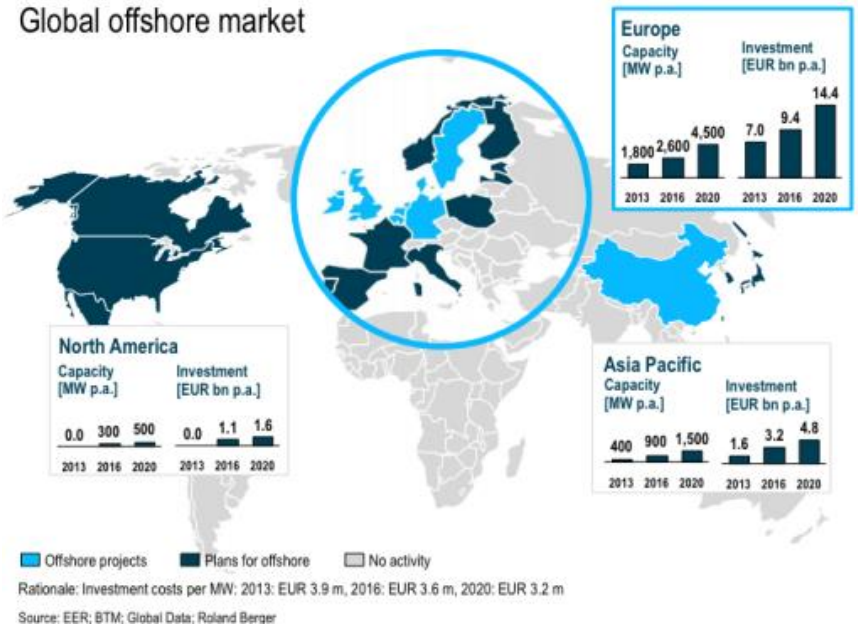


[4]

Chart 4 World total primary energy production

Concerning global offshore market, there are many countries that already have offshore projects and others with plans to go offshore. The graph below shows the investment and also, the capacity, where Europe shows up as the winner in capacity.

[3] http://www.capgemini.com/resources/european-energy-markets-observatory-2013-full-study
[4] http://en.wikipedia.org/wiki/File:World_total_primary_energy_production.png



[5]

Chart 5 Global offshore market

a. Market of energy in Europe

In 2007 the EU Treaty was established and due to that the energy policy changed. In 2007 EU was the world leader importer of oil (82%) and gas (57%). These fuels were imported from countries such as Russia, Australia, Niger, Canada and Kazakhstan, they were supplying around the 75% in 2009.[6]

The first proposals of the EU were written in the 'Energy for a Changing World' in 2007, the EU wants to establish a low-carbon economy were the competition increases in the energy markets. Some of the proposals were:

- 20% less greenhouse emissions from primary energy sources in 2020 (compared to 1999) and a wish to succeed de Kyoto Protocol (30% in all developed countries)
- 95% less carbon emissions from primary energy sources by 2050
- A minimum target of 10% for the use of biofuels by 2020
- 20% of total energy consumption from renewable energy
-

[5] http://www.rolandberger.com/media/pdf/Roland_Berger_Offshore_Wind_Study_20130506.pdf
[6] http://batterys.over-blog.com/45-index.html

- Increase of market competition (most countries used to have monopolies of a national company)
- Improve relations with adjoining countries
- Development of a plan to develop technologies in different energy areas
- Develop an Africa-Europe Energy partnership to lead Africa to low-carbon technologies and help them to be a future sustainable energy supplier.[7]

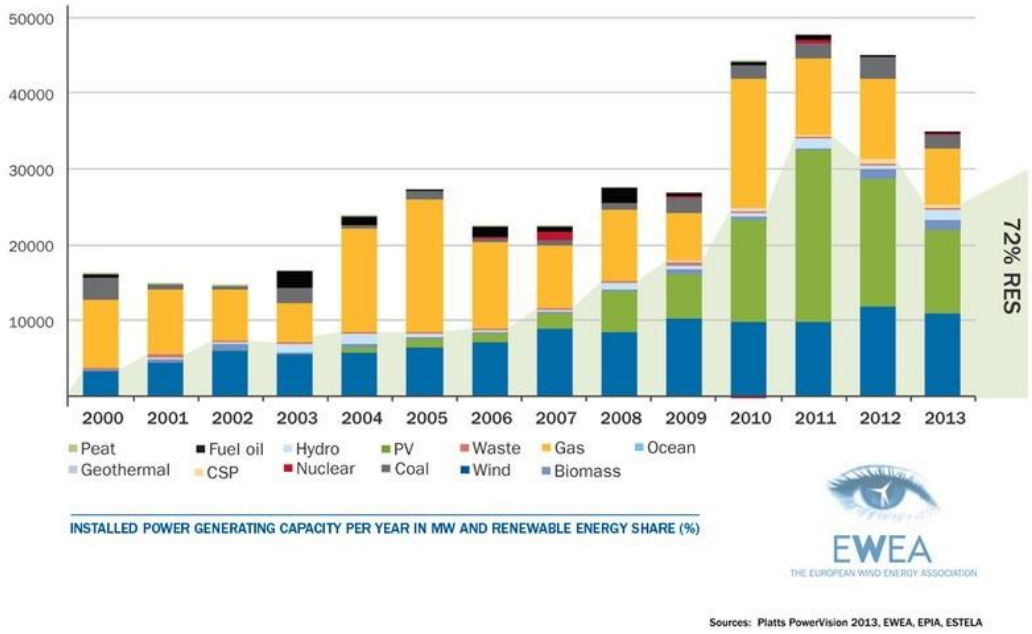
EU wanted to limit and reduce global temperature to be not more than 2ºC above pre-industrial levels. 2030 targets are already set and include 40% less greenhouse gases, 30% of total energy from renewables and 40% improvement in energy efficiency. [8]

Some actions have been needed to achieve all this goals, but while all those actions have been satisfactory in the industrial sector, transportation and building areas have not been satisfactory at all. Many norms have been established in new building constructions but still many existing buildings where energy efficiency is low. There are some countries like France where there are many subsidies and financial help.

The economic crisis impacted in electricity consumption, in decreased by 0.2% in 2012[9].

The graph below shows the power generating capacity per year in EU divided in the diffferent kinds of energies. It also shows the growth they have had from 1995 to 2013 and the decrease of the wind energy power installes from 2012 to 2013 due to global crisis and political uncertainty. The France wind power installed has decrease a 24% that year.[10]

[7] http://en.wikipedia.org/wiki/Energy_policy_of_the_European_Union
[8] http://www.theguardian.com/environment/2014/feb/05/european-parliament-votes-renewables-targets
[9] http://www.capgemini.com/news/capgeminis-european-energy-market-observatory-instability-in-electricity-and-gas-markets
[10] http://dailyfusion.net/2014/02/eu-wind-energy-growth-slows-in-2013-26421/



[11]

Chart 6 Installed power generating capacity per year in MW and renewable energy share

We can also see in the graph how wind energy has a big share of the power installed capacity and that ocean power is growing.

i. Renewable energy in Europe

Boosted by the objective of 20% of renewable energy in the total consumption by 2020, many actions concerning renewables development have been implanted and have reached to produce the 45% of the renewable energy used worldwide.

Electricity generated by these sources is forecasted to grow in Europe and in developed countries and should provide 60% of the electricity production growth in the next 6 years.

Due to economic crisis, there have been many reductions in subsidies that have caused a reduction in the renewable capacities installations (2010-2011->29% / 2011-2012->21%).[12]

[11] http://dailyfusion.net/2014/02/eu-wind-energy-growth-slows-in-2013-26421/
[12] http://www.de.capgemini.com/resource-file-access/resource/pdf/1310_capgemini_eemo15_editorial.pdf

This graph shows the renewable energy share that the EU is supposed to have in 2020 following the compromises. It indicates that wind and ocean energy have a big proportion of the market.

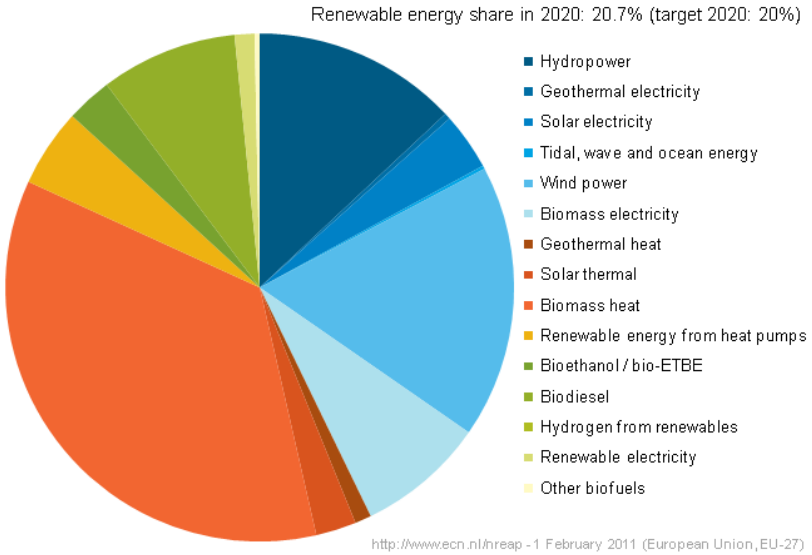


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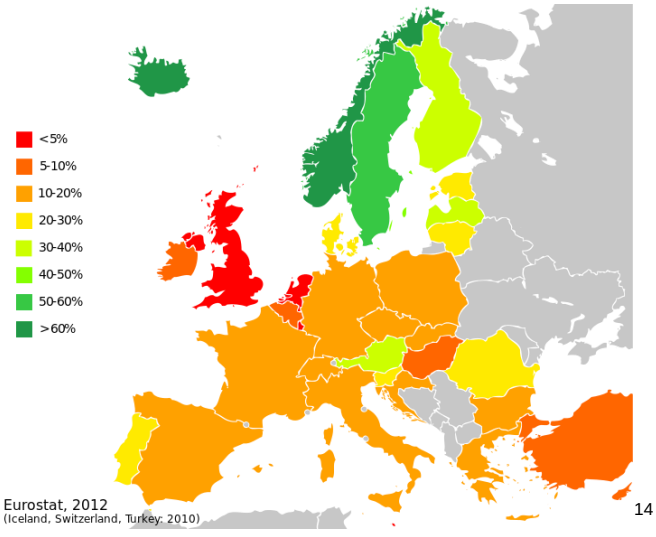
Chart 7 Renewable energy share in 2020

This graph shows the proportion of renewable energy in the EU as percentage of total consumption in each country. There we can see how the Nordic countries are the ones with the biggest renewables share.



14

[13] http://www.ecn.nl/docs/library/report/2010/e10069.pdf
[14] http://en.wikipedia.org/wiki/File:European-union-renewables-new.svg

Chart 8 Share of renewable energy in each European country

b. Market of energy in France

In 2007 the French energy market was opened to competition, since then, individuals can choose their energy provider. Not all the providers serve every city, and not all the regions have more than one provider, so in some cases there is an energy monopoly.

Before the market was opened, there were many price increases, so the government decided to regulate it. Now there are regulated prices and market prices and the consumer is free to choose between them. Despite these changes, customers often choose regulated prices because the system is quite confusing for most of the people.[15]

There's a state website called http://www.energie-info.fr/ that acts as a comparator and register a lot of information about the different electricity companies.

The electricity price in France is one of the lowest in Europe; comparing with Germany, it is 25% lower for industry. This is because France use nuclear and hydroelectric power as the main resources and they are one of the cheapest energy sources; and besides, France don't have high electricity taxes[16].

[15] http://www.erdf.fr/Electricity_market
[16] http://epp.eurostat.ec.europa.eu/statistics_explained/index.php/Energy_price_statistics

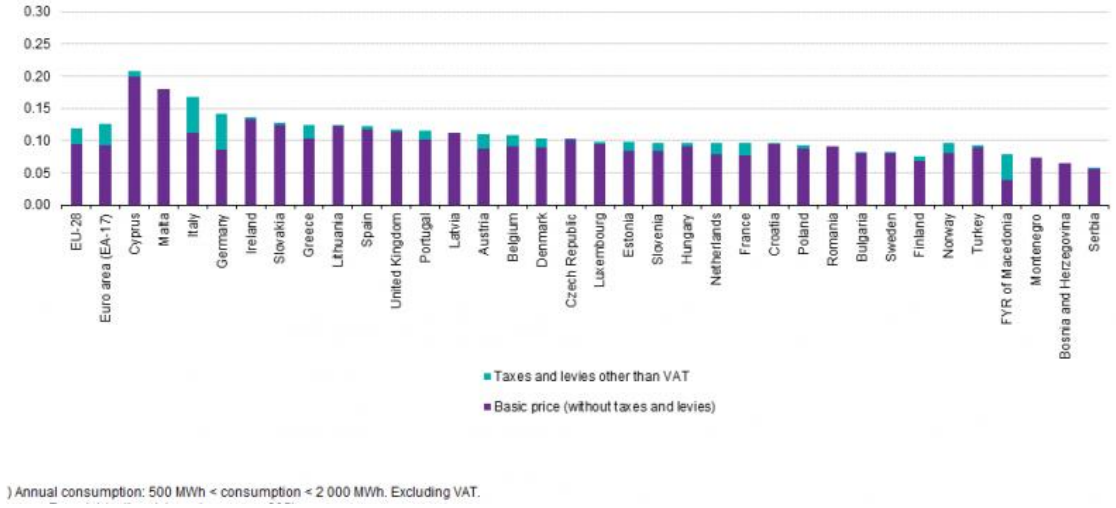
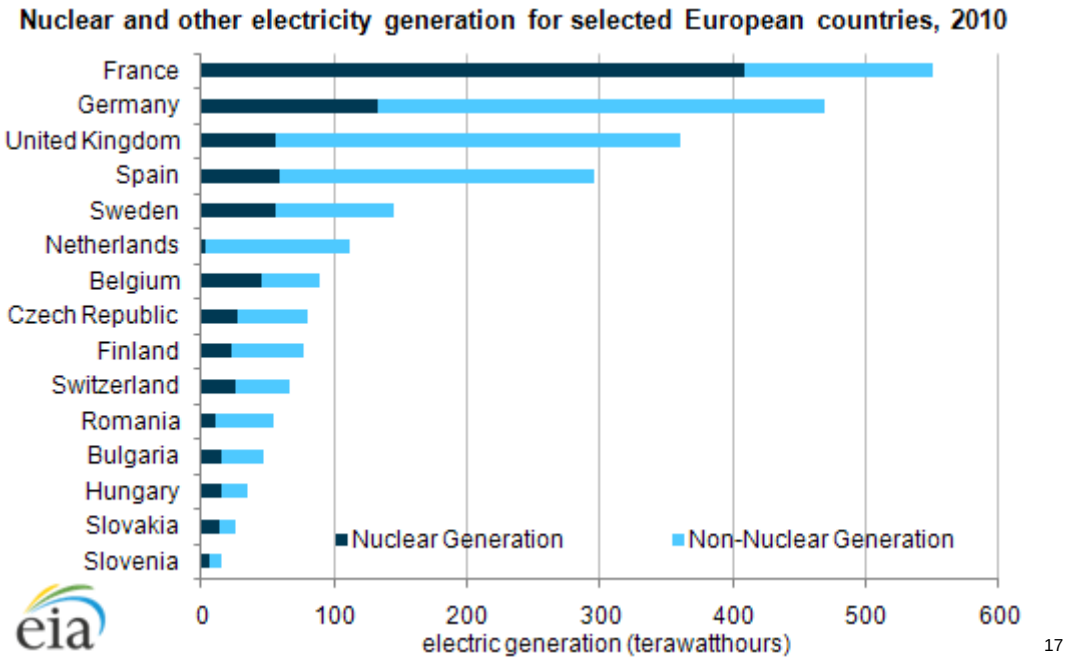


Chart 9 Electricity prices for industrial consumers

France is one the world's biggest electricity producer (22% of EU production) due to its nuclear plants.



[17]

Chart 10 Nuclear and other electricity generation by country

France main source of energy is nuclear energy as the graph below shows, and the weight of renewables is increasing in the last years.

[17] http://www.eia.gov/todayinenergy/detail.cfm?id=2230

Patricia Zurano-Perez 206113
Irene Salinas 203955
Agustin Mesa Lombardo 206063
Jean-Philippe Santini 204005

Chart 11 France electricity producion

1819

FRANCE (source : EDF)

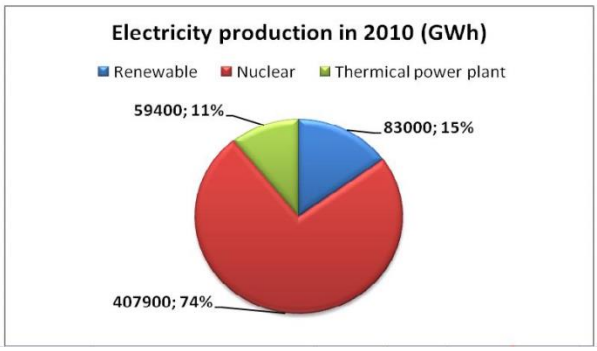
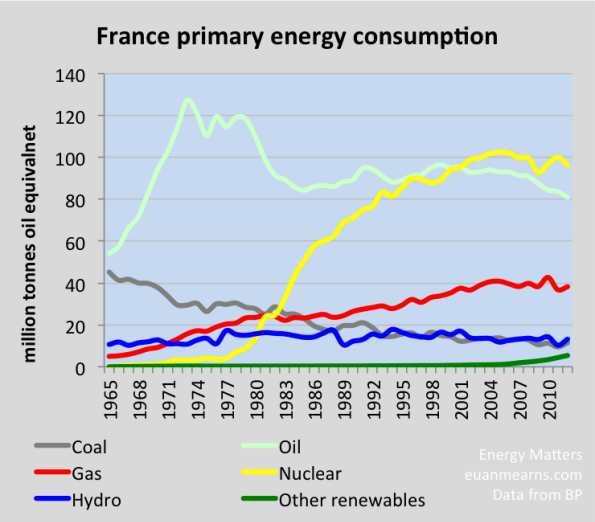


Chart 12 France primary energy consumption



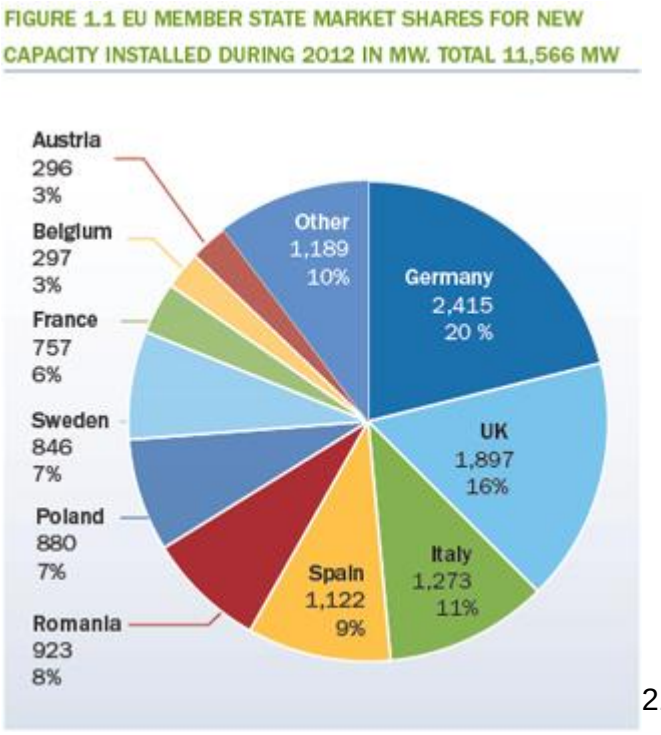
i. Renewable energy in France

Regarding renewable energies, France wasn't pioneer in the renewables energy sector but the government has made big investments that have positioned the French market as one of the largest in Europe. In 2006, the value of French market was estimated in 3.8 billion euros; and if the EU objectives are achieved, the value of the market will increase to 25.5 billion euros. [20]

In this graph we can see the France market share (6%) for new capacity of renewable energies installed.

[18] http://euanmearns.com/energiewende-germany-uk-france-and-spain/
[19] http://www.wrsc.org/attach_image/electricity-production-france-2010
[20] http://www.nccommerce.com/Portals/5/Documents/ITD/France%20Renewable%20Energy%20Market%20Overview.pdf

Chart 13 EU member state market share for new capacity installed during 2012 in MW



[21]

In 2007, France established a strategy for the renewable energies development (NREAP) to control energy consumption and promote renewable energies. The government set some measures to achieve the target of 23% of renewables in the total energy consumption:

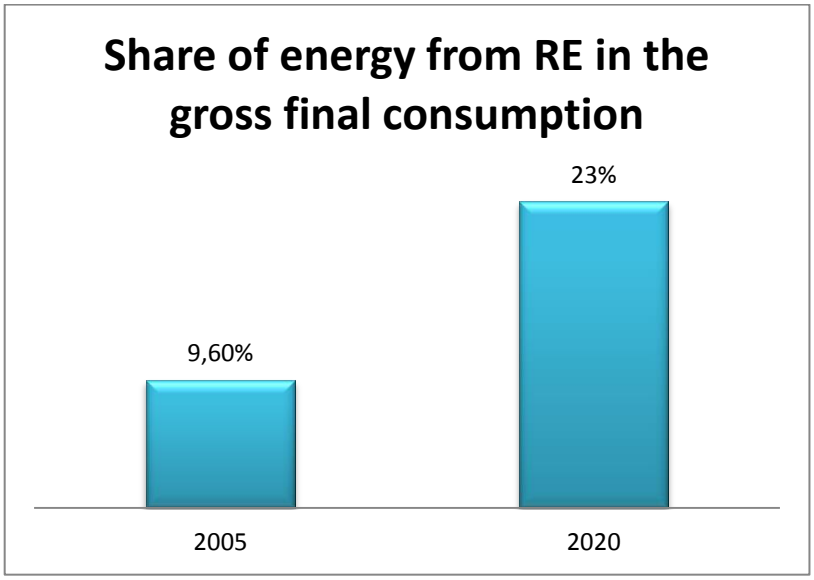
- Additional production of 20 Mtoe compared to 2006 by 2020
- Consider all sources of renewable energy to position France as a major producer in all technologies.
- Financial aid for research and development of projects
- Aid for the installation or purchase of equipment
- Position as the leader in wind power, maritime energies, solar…

France targets for renewable energies in 2020:

[21] http://www.ewea.org/fileadmin/files/library/publications/statistics/Wind_in_power_annual_statistics_2012.pdf

France is developing the renewable energies field to be able to consume a 23% of renewable energies in the total consumption by 2020 where in 2005 the consumption was only a 9.60%

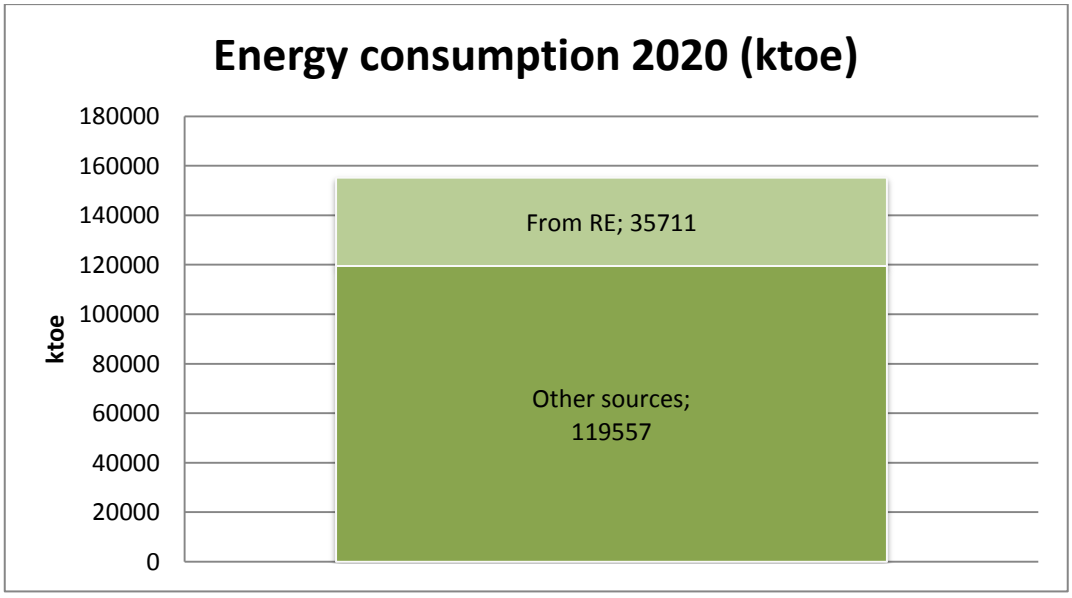
Chart 14 Share of energy from RE in the gross final consumption



[22]

The graph below shows the forecasted energy consumption in France in 2020:

Chart 15 Energy consumption in France by 2020



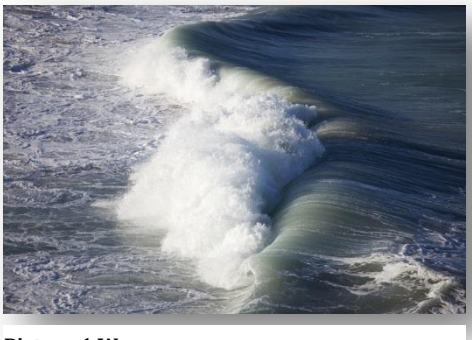
[22] NREAP France

2. Presentation of wave and wind energy

i. Wave energy

"Wave power is the transport of energy by ocean surface wave, and the capture of that energy to do useful work – for example, electricity generation, water desalination, or the pumping of water (into reservoirs).

Wave-power generation is not currently a widely employed commercial technology, although there have been attempts to use it since at least 1890. In 2008, the first experimental wave farm was opened in Portugal, at the Aguçadoura Wave Park. The major competitor of wave power is offshore wind power." [23]



Picture 1 Waves

Wave energy farms:

- 0.4 MW and 0.5 MW Oscillating Water Column plants off the islands of Pico and Islay
- 0.2 MW AquaBuOY of the coast of Oregon, USA
- 2.25 MW Pelamis of the coast of Portugal by 2008;
- 7 MW Wave Dragon of Wales coast by 2008-2009[24]

ii. Wind energy offshore

[23] http://en.wikipedia.org/wiki/Wave_power

[24] http://www.ipcc.ch/pdf/special-reports/srren.pdf

"Offshore wind power refers to the construction of wind farms in bodies of water to generate electricity from wind. Better wind speeds are available offshore compared to on land, so offshore wind power's contribution in terms of electricity supplied is higher, and NIMBY opposition to construction is usually much weaker. However, offshore wind farms are relatively expensive. At the end of 2012, 1,662 turbines at 55 offshore wind farms across 10 European countries are generating electricity enough to power almost five million households. At the end of June 2013 total European combined offshore wind energy capacity was 6,040 MW." [25]

Picture 2 Offshore wind turbines

iii. Wave and wind energy

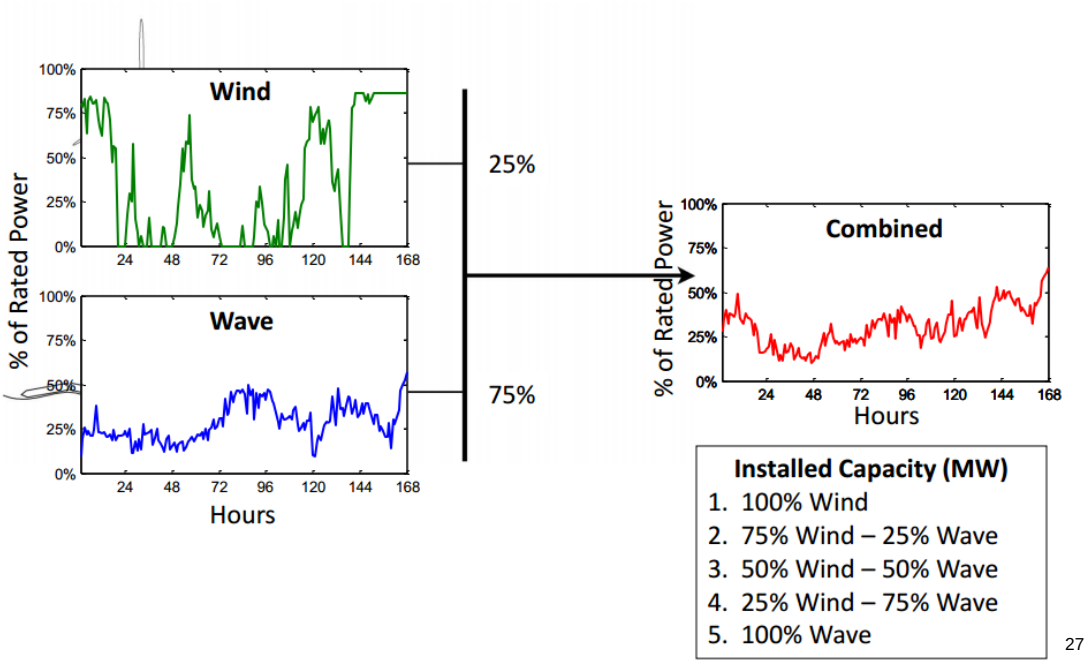
Combining this two technologies result in one platform with a large potential and more efficient.

26

[25] http://en.wikipedia.org/wiki/Offshore_wind_power

The wave and wind energy platform reduce the time without energy production.

Chart 16 Hours of production



[27]

Many projects that combine these two technologies are being developed in the last years like the W2POWER that sells the whole platform to produce energy.[28]

b. Comparison with other energies

There are many advantages and disadvantages in the use of wave energy compared to other sources.

Comparing with non-renewables, wave energy doesn't produce CO2 emission due to no fuel is needed.

It has a predictable energy output due to waves are generated a long way from shore and it is possible to forecast the waves up to five days in advance.

It reduces the dependency on imported fuels.

[26] http://www.floatingpowerplant.com/log/files/FPP_Dec09Low.pdf
[27] http://energyseminar.stanford.edu/sites/all/files/eventpdf/EStoutenburg23Apr2012.pdf
[28] http://www.pelagicpower.no/

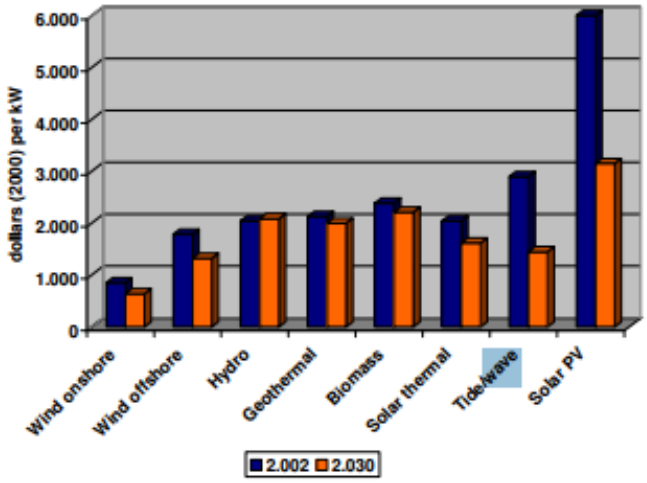
Wave energy has a huge potential, it is estimated to be around 8000-80000 TWh/year so it could satisfy 5 times the total global electricity demand (16000 TWh/year)[29]

But also, wave energy has some barriers compared to other sources; there are some difficulties like electrical grid access, high price, data availability and visual impact as the platform could be a danger for ships.[30]

One of the main problems of wave energy is the cost, the graph shows how it is one of the most expensive sources but the price is expected to decrease with the technology development. Regarding wind offshore, it is a bit lower than other sources like solar thermal or hydro

Chart 17 Capital costs of renewable energy technologies 2002-2030

Figure 17: Capital Costs of renewable Energy Technologies, 2002 and 2030



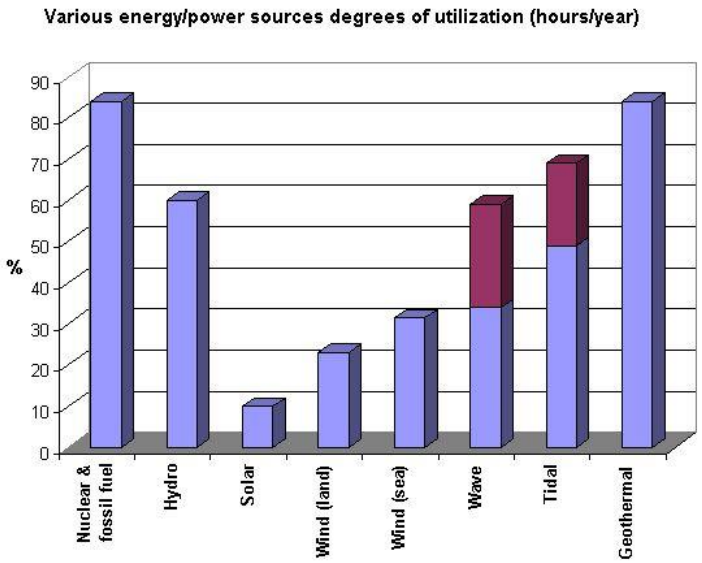
Source: WEO, 2004 [31]

Concerning the number of hours the source produces energy during the year, wave energy comes out as one of the most productive sources with almost a 60% of

[29] http://www.ipcc.ch/pdf/special-reports/srren.pdf
[30] http://www.aquamarinepower.com/technology/why-wave-power/
[31] http://www.ipcc.ch/pdf/special-reports/srren.pdf

utilization winning other sources that are more used like onshore wind or solar. Wind offshore wins also solar and onshore wind and produces energy around a 30% of the year.

Chart 18 Various energy/power sources degrees of utilization (hours/year)

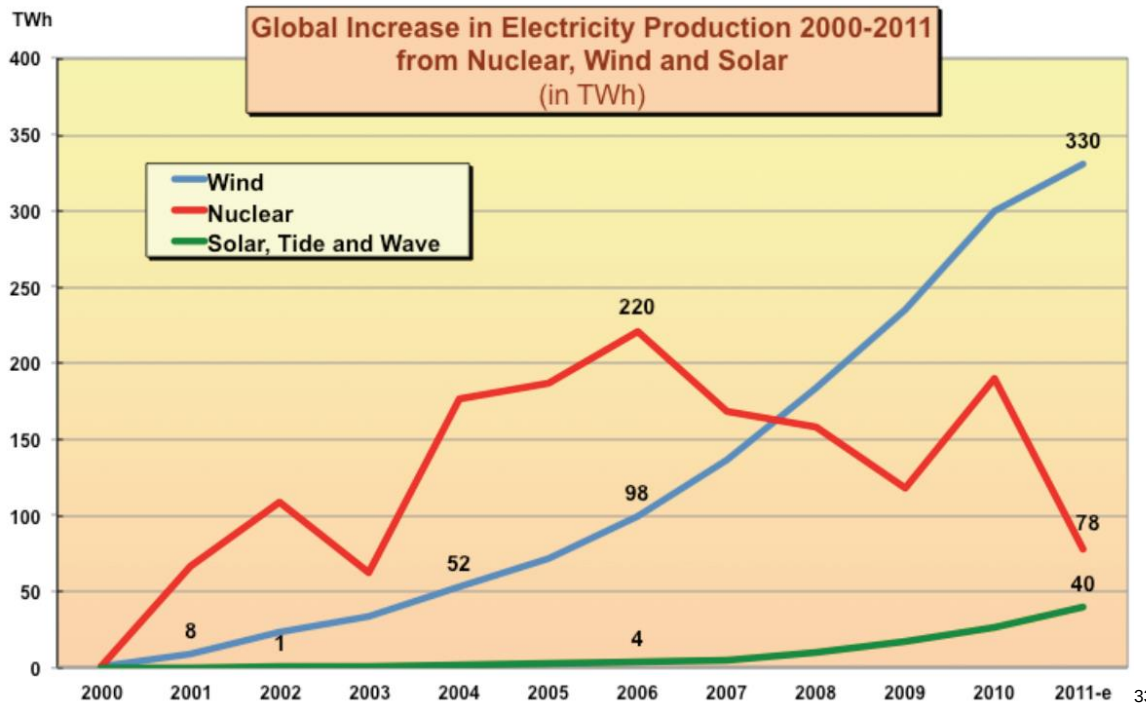


[32]

Wind is also one of the sources that are growing more in the last years and also wave energy; in the graph we can see how nuclear energy is decreasing its production, and as France is one of the main world producers of nuclear energy, if the production decreases they will have to look for new energy resources.

[32] http://www.el.angstrom.uu.se/forskningsprojekt/WavePower/Lysekilsprojektet_E.html

Chart 19 Global increase in electricity production 2000-2011



[33]

3. Wave and wind energy worldwide

Wave energy plants are forecasted to produce over 2000 TWh/ year by 2025 which could suppose around 800 billion euros of investment.[34]

a. In Europe

i. Wave energy

Wave energy is a resource that is starting to be exploited by many European countries where over the past decade a big progress has been made.

[33] http://www.worldnuclearreport.org/The-World-Nuclear-Industry-Status.html
[34] http://www.cleantechscandinavia.com/CleantechScandinavia/PdfBySpeaker/AW%20Energy_Tuomo%20Hyysalo.pdf

'In the last twenty-five years wave energy has gone through a cyclic process of phases of enthusiasm, disappointment and reconsideration.' (Wave energy brochure)

The efforts and researches in wave energy have made possible to exploit it commercially. There are many installed plants in Europe like Portugal, France or United Kingdom.

There is still need more development in this field in order to compete with other sources.

In the last five years the interest in this resource has increased and many companies have started to develop technologies to exploit it. Nowadays the installed capacity in the world is 2MW.

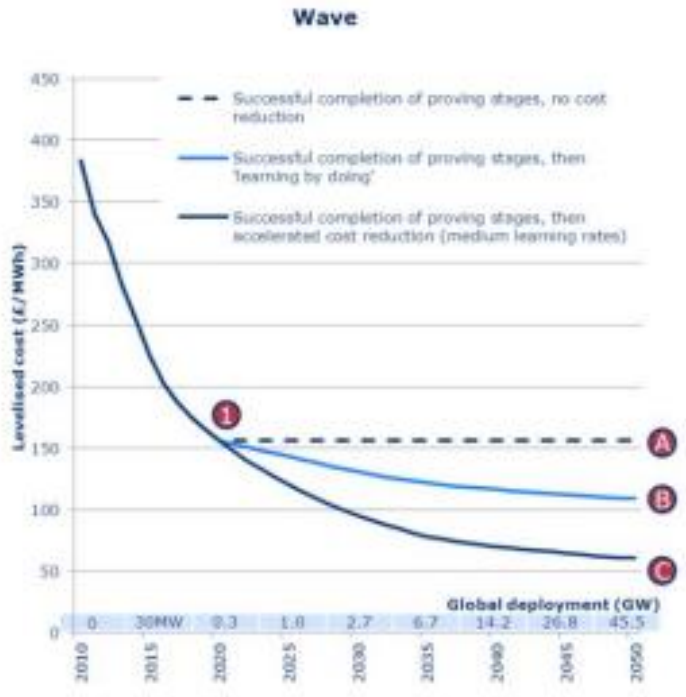
The wave energy potential economic contribution is high and is forecasted to be around 2000TWh/year with a cost of 820 billion euros and representing the 10% of world electricity consumption. [35]

Electricity price from wave energy in average is around 0.075 euro/kWh so compared to the average electricity price in Europe which is 0.04 euro/kWh, wave energy price is high but it decreases with the development of the technology.[36]

The graph below shows the cost of the energy per year where it is possible to see the reduction of the cost with the technology development

[35] http://www.cres.gr/kape/pdf/download/Wave%20Energy%20Brochure.pdf
[36] http://www.oceanenergycouncil.com/ocean-energy/wave-energy/

Chart 20 Wave energy cost



[37]

In the graph we can see the locations of offshore wind and wave energy in Europe.

Chart 21 Offshore renewable energy location

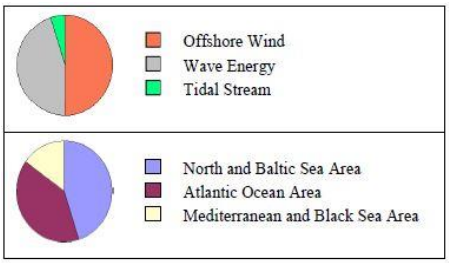


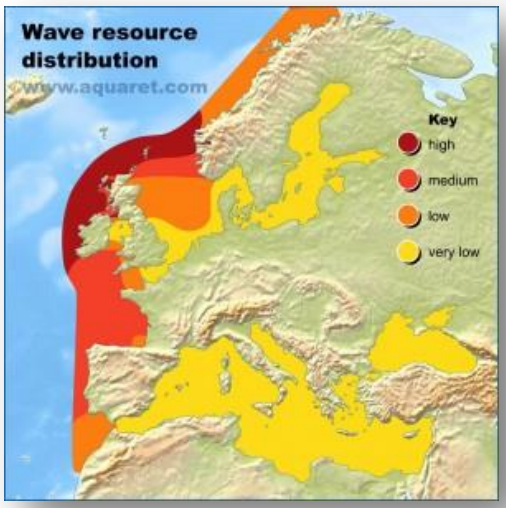
Figure C: Breakdown of Europe's offshore renewable energy resources across the three technologies and the three regions which the seas surrounding Europe were divided into.

[38]

The picture below shows the wave resource distribution in Europe where we can see that above the UK and in France the waves strength is high.

[37] http://si-ocean.eu/en/upload/docs/WP3/Technology%20Status%20Report_FV.pdf
[38] http://www.orecca.eu/c/document_library/get_file?uuid=1e696618-9425-4265-aaff-b15d72100862&groupId=10129

Chart 22 Wave resource distribution



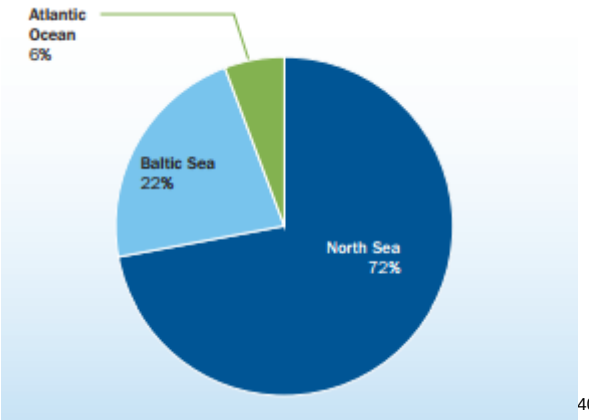
[39].

ii. Wind energy

In 2013, 21 offshore wind plants were built in Europe in the following countries: UK, Belgium, Germany, Denmark, Sweden and Spain.

The plants are located in these places:

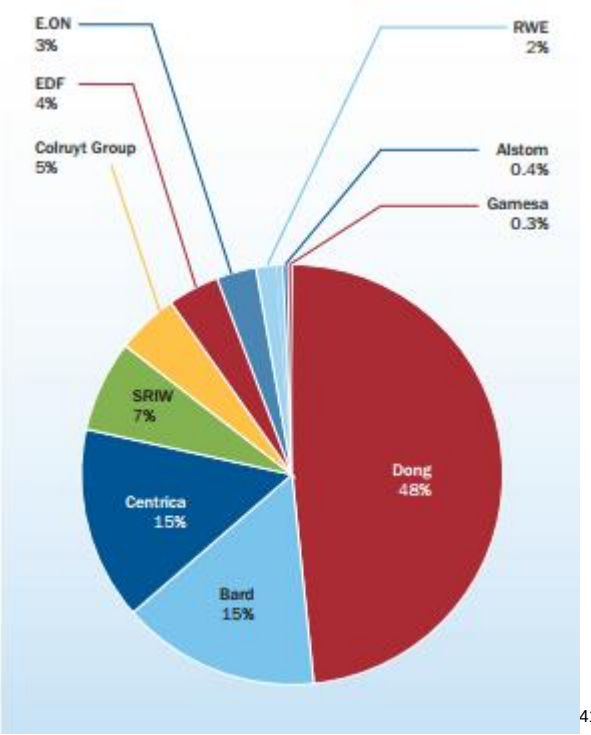
Chart 23 Offshore wind plants location



[40]

[39] http://www.powerengineeringint.com/articles/print/volume-20/issue-1/features/riding-a-wave-of-potential.html
[40] http://www.ewea.org/fileadmin/files/library/publications/statistics/European_offshore_statistics_2013.pdf

The main developers of these technologies are shown in the graph below, where DONG is the one with the highest share

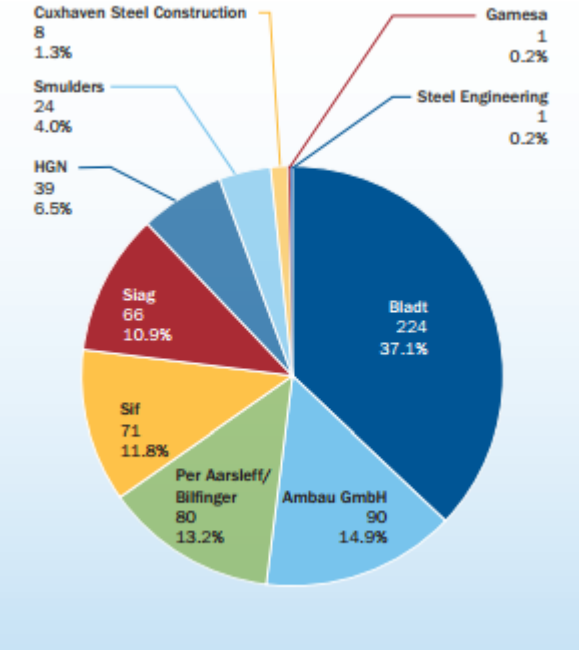


[41]

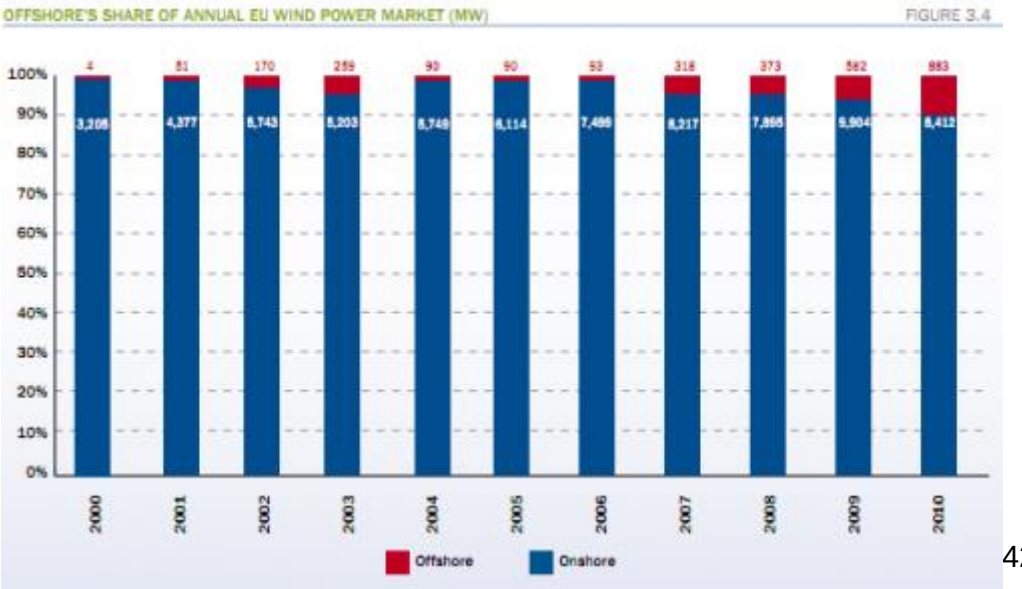
The companies that supply foundations for offshore wind projects are the ones below, where Bladt is the biggest with 224 foundations:

[41] http://www.ewea.org/fileadmin/files/library/publications/statistics/European_offshore_statistics_2013.pdf

Chart 24 Foundations suppliers



European Union offshore wind power is increasing every year and gaining share of the market compared to onshore installations.



[42]

[42] http://www.ewea.org/

The cumulative and annual offshore wind installations is increasing fast in the last decade in Europe.

b. In France

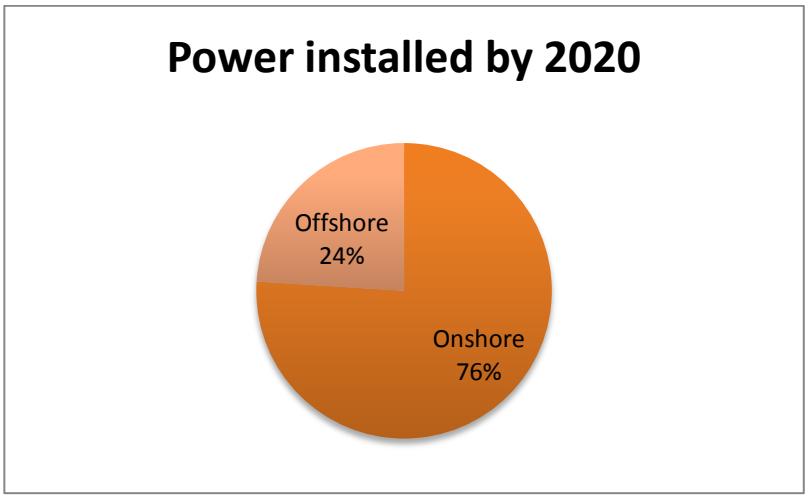
Concerning the production of renewable energy by 2020, waterpower will have an annual production of 66GWh and wind energy will be the second producer with 57000GWh; these energies will produce the 80% of the renewable energy.

Regarding wave power there is a potential of 200MW for 4000h of operation, but the technologies are not enough developed, the action plan that France is implementing will make a 25% of its potential start to produce in 2020.

[43]

According to wind power in 2020, 25000 MW should be installed by 2020 of which 6000 MW should be offshore[44].

Chart 25 Power installed by 2020



[45]

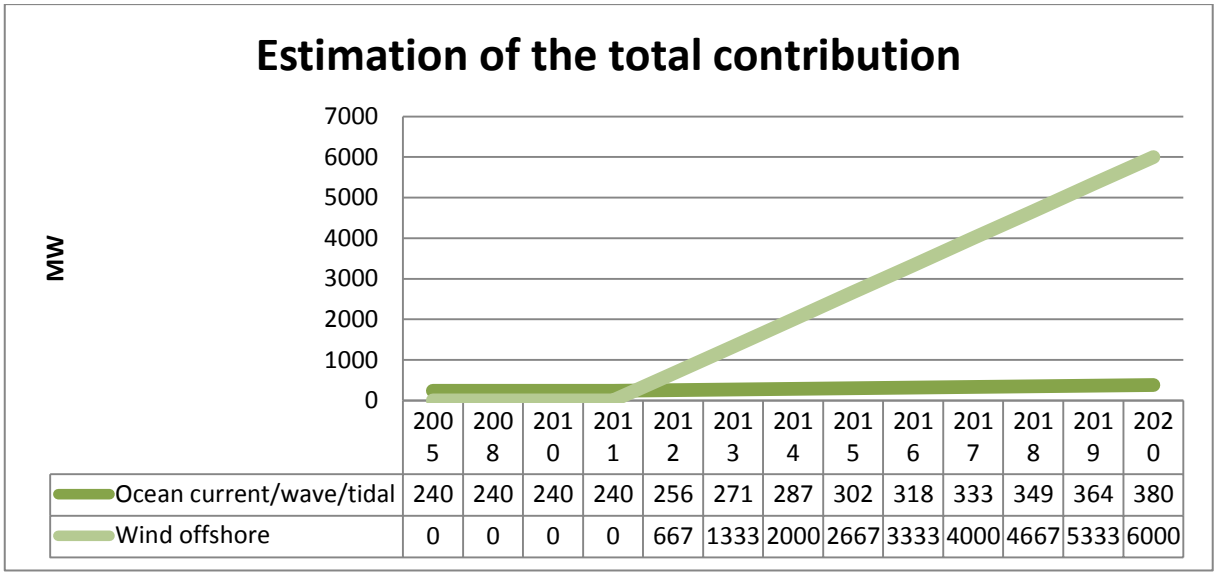
[43] http://www.aquamarinepower.com/sites/resources/Reports/3139/Member%20State%20Position%20Paper%20on%20Ocean%20Energy.pdf

[44] http://www.ewea.org/fileadmin/files/members-area/information-services/offshore/presentations/Oceans_of_opportunity_-_OWIG_presentation_by_N._Fichaux_-_16_September_2009.pdf

[45] NREAP France

The graph below shows the expected contribution of wave and wing energy offshore in the electricity sector in order to achieve the 2020 targets.

Chart 26 Estimation of the total contribution



[46]

- Incentives

France is now supporting the renewable energies development in order to achieve the 23% of final consumption from renewables by 2020, due to this goal is difficult to get, the French government is trying to speed up the development of these technologies through feed-in-tariffs that guarantee revenues for a long period in order to attract investors.

These feed-in-tariffs are below:

Chart 27 France incentives

Sector	Orders regu-	Duration	Example for prices in

[46] NREAP France

	lating the purchase of elec-tricity		**service**
Water power	1 March 2007	20 years	6.07 euro cents/kWh + bonus between 0.5 and 2.5 euro cents/kWh for small facilities + bonus between 0 and 1.68 euro cents/kWh in winter depending on production regularity
	25 June 2001	20 years	5.49 to 6.1 euro cents/kWh (36 to 40 euro cents/kWh) according to the power rating + bonus between 0 and 1.52 euro cents/kWh (10 euro cents/kWh) in winter according to production regularity
Wind power	17 November 2008		13 euro cents/kWh for 10 years, then between 3 and 13 euro cents/kWh for 10 years depending on the sites
	10 July 2006	20 years (sea-based)	13 euro cents/kWh for 10 years, then between 3 and 13 euro cents/kWh for 10 years depending on the sites[47]

Source: National renewable energy action plan France

[47] NREAP France

Implementing a renewable energy project in France is a hard task that requires many years to be able to implement it because there are financial problems but some banks still financing renewables projects and another important thing is that good relationship with French agents is necessary.

The problem with this incentives is that renewables is not a stable market because the French government is still implanting some measures to achieve 2020 goals and also to reduce nuclear share from 75% to 50% by 2025 and policies and laws change very often.[48]

Despite change policies, feed-in-tariffs assure revenues and therefore a low-risky investment.

Conclusion

In order to know why companies want to spend more money paying clean energy rather than nuclear energy or other sources that are cheaper we have to understand:

World energy need is increasing every day due the increase of population, industry and better living standards; and besides, the lack of fossil fuels.

That's one of the reasons that make governments look for new energy resources (like wave and wind energy)

The climatic change is a big problem nowadays that have made the governments try to reduce CO2 emissions and look for new ways of renewable energies. Europe has some goals that have to accomplish within 2020. This goals affect France that created a road map NREAP that is compulsory for all the EU countries and that set the objectives and the action plans to achieve those goals

French government, in order to achieve those objectives has implement several actions like feed-in-tariffs for the production of renewable energies

One of these goals is 20% of total energy consumption from renewable energy in 2020.

To reduce the emissions the governments benefits companies and private households to install renewable energies and limit the emissions putting fines.

[48] http://www.neimagazine.com/news/newsfrance-reaffirms-plans-to-reduce-nuclear-share-to-50-by-2025

Companies try to reduce emissions by using clean energies and also to accuire special ecologic certificates, they need to use green energy.

Companies using renewable energies have a better image, this is more usefull for companies with a environmental policy strategy.

Governments have also opened the energy market due to abusive prices increasing and to make possible for green electricity suppliers to enter in the market. Now customers can choose which source they want.

Due to this open market is now possible to sell our ocean and wind energy.

France has recently open the electricity market as other countries are doing in the past years, the electricity market years ago was full of monopolies but laws have changed and made possible to choose.

Customer Study

We have not found data regarding the demand for green energy of French companies. This is why we decided to create a survey to define ourselves this request. More specifically the purpose of this section is to define if there is an opportunity to sell green electricity to businesses in France and especially if yes, what kind of a client (target group). The goal here is to directly ask interested, their feelings about green electricity to then build a marketing strategy both in agreement with potential customers and current market offer.

Choice of French customer

We decided after discussion with the members of the project and the coordinator to make the market study of our project in French market, and this for several reasons:

- Although we are students in Denmark, our Danish market knowledge is limited, and none of us speak Danish, it could cause problems because although the level of English is high, all Danish companies do not speak the language of Shakespeare.
- According To (Terra Eco, 2009), the French green energy market is still in launch phase (in 2013 only few companies proposed 100% green electricity).

A. Creation of a questionnaire

1. Specifications of the questionnaire

- Objective of the survey:

– Define the customer segment with the highest potential of selling.

– Find out the main reasons that a company might want to change its electricity supplier to a green supplier, in other words the companies' motivation. We already can make the hypothesis that the three main reasons will be:

1. Environmental awareness
2. Branding
3. Price.

Although there are only suppositions and other sources of motivation may be discovered during the study, but we guess that these are the main reasons to change for green electric supplier.

- Target: French companies, from -10 to 500 employees, which offering services or product. We decided to stay focus on this size range of companies because we stated that it might hard for a starting company to supply electricity to large multisites companies. For a starting company its might be hard to supply electricity for multisites company. Later in the part “Definition of the target” we will use the funnel model to segment with more precision our target.

- Administration of the questionnaire: Choice of phone calls and or teleconference. The decision has been chosen using phone calls to optimize the response rate of the questionnaire, which one is often weak by email or letter. Moreover phone support helps to explain more precisely the intentions of the questionnaire and to build a social bond with the target. The phone call is also a way to have more detailed answers and ask questions that were not on the questionnaire but can still be interesting.

- Approximately 10 questions in the questionnaire because it will be more long and less customers will want to respond.
- Number of response: to enable us to exploit statistical data from the questionnaire, a minimum of 25 responses is necessary.

2. Definition of the target

a) Funnel Mode

To segment our target customer, we used the model of the funnel; thanks to this one we can define the target of our survey more accurately. The functioning system of this model consists to select the segmentation’s criteria from the widest to the most accurate one.

Image 1: Modelization of the Funnel Model

(1) Economic Sectors

Companies from the three economic sectors will be interviewed.

(2) Size

The sizes of companies surveyed will be from -10 employees to 500 employees.

(3) Localization

The criterion of economic sector is very broad at the scale of France and we do not have the technical skills to achieve a large-scale customer study. Thus, we decided to put a location criterion to target specific areas. We can thanks to the economic map below determine the most interesting zones for our study based on economic specialization areas.

For the Primary sector, in other words agriculture, we decided to focus on organic farms, in the region of “Midi Pyrenees” which is according to the report “French Organic Agriculture in 2012” of (French Agency for Development and Promotion of Organic Farming 2012), the second region of France in terms of certified organic farmers. The entire primary companies that we found out are certified Organic; we used a database from the Association of French Organic producers.

- For the secondary sector our choice will be the “Rhone Alps” region, which is the second richest region of France and where the industry is very dynamic (French Institute for Economical and Social Studies 2012).

- Concerning the Service sector our choice is the "Ile de France" region. According to (French Institute for Economical and Social Studies 2012) the GDP of the region for 2012 is 612 billion euros (36% of national GDP), 82% of GDP is created by the tertiary sector.

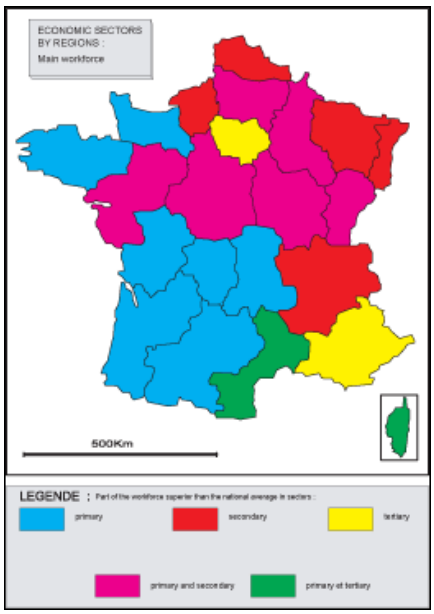


Image 2: (French Institute for Economical and Social Studies 2012)

- Activity Sectors

Despite the target segmentation by region and economic sector, the choice of targets was still vague. This is why we added another criterion segmentation, the industry’s specialization of the company inside of her economic sector. The goal is to choose different industries sectors to have a better representation of each industries motivation.

Primary	Secondary	Tertiary
Agriculture: Organic Wine Farmed Animals Food-processing	Steal and metal manufacturing Medical Products Foundry Manufacturing	Catering Small Shops Corporate Services Consulting Accounting

Milk Meat Cheese	Eco-Construction High Technology Medical Laboratory	Real Estate Communication Retailing ICT

3. Selection of companies

The selection of companies is not final because companies could refuse to answer the questionnaire.

Company	Industry	Economic Sector	Place	N° of employees
Cvlc	Industrial glue manufacture	Secondary	Feillens	17
Cair L.GL	Medical Products manufacture	Secondary	Lissieu	105
Bralo France	Industrial Machinery	Secondary	Saint Quentin Fallavier	200
Moulaire	Foundry	Secondary	Meyzieu	62
Socrima	Meteorological devices	Secondary	Trevoux	5
Domibio	Eco-Construction	Secondary	Lyon	28
GIRIER-SLII	Steal products manufacturing	Secondary	Chassieu	21
Pia Gazil	Industrial Painting	Secondary	Decines	42
Chez Toinette	Catering	Tertiary	Paris	13
Hédonie		Tertiary	Paris	5
Alex Hiarcut	Small Shops	Tertiary	Paris	2
Pressing de la comète	Small Shops	Tertiary	Paris	1
Foncia	Real Estate	Tertiary	Paris	4

transaction location	Agency			
Radis Noir	Communication Agency	Tertiary	Paris	4
Au vieux campeur	Outstyle goods retailers	Tertiary	Paris	50
Cap conseil	Accounting	Tertiary	Paris	11
Biovercité	Vermicomposting	Primary	Mauzac	14
Ferme Grillet	Cobb broiler	Primary	Gaillac-Toulza	8
Ferme Capdecomme	Cattle industry	Primary	St-Christau	3
GAEC des maronniers	Milk	Primary	Troncens	5
Chateau Bourjac	Wine	Primary	Campsas	8 (40 during the grape harvesting time)
Petit Basque	Agri-food processing	Primary	St Médard d'Eyrans	30
Soy	Agri-food processing	Primary	Revel	35
Fromagerie Papillon	Cheese making	Primary	Roquefort-sur-Soulzon	40
EARL Bioferme de la Burce	market garde-ning	Primary	Terrebasse	2
Courb	Production of electric cars	Secondary	Lyon	8
Alvoe	Electronic de-vices recycling	Secondary	Lyon	62
BASF Agro	Phytosanitary products	Secondary	Ecully	100
Genzyme	Laboratory	Secondary	Gerland	240

Citadium	Shop	Tertiary	Paris	40
Cleantech	Business incubator	Teriary	Paris	20
Green Univers	Cleantech website	Tertiary	Paris	10
Ulule	Participative Financing	Tertiary	Paris	8

4. Questionnaire

In our case the drafting of the questionnaire can also be defined as a phone script. Before writing the questionaire or whatever, we need to write a scenario to be prepared during the phone call.

a) Introduction Scenario

Hello, My name is (Jean-Philippe Santini or Irene Salinas), (I am a French student or Spanish). I would like to ask you some questions related to your electricity provider. I want to reassure you that the information that you will give me will help me for a university project and have no commercial purpose. I just have ten questions to ask you and I can call you later at your convenience if you are busy for the moment.

b) Questions

1. Who is your current electric supplier?
2. I see on my data base that ... employees work in your company is that correct? (Or for the primary companies “What is the size of your exploitation?)
3. Do you have energy-consuming machinery?
4. Of the following image parameters which do you consider most important for your company

- Quality
- Price competitive
- Service
- Novelty Technology
- Social responsibility&
- Ecologic responsibility

5. What is your level of satisfaction in relation to your current electricity supplier?

- Very satisfied
- Moderately satisfied
- More or less satisfied
- Not at all satisfied

6. Have you ever consider change your electric supplier?

- If yes, why?

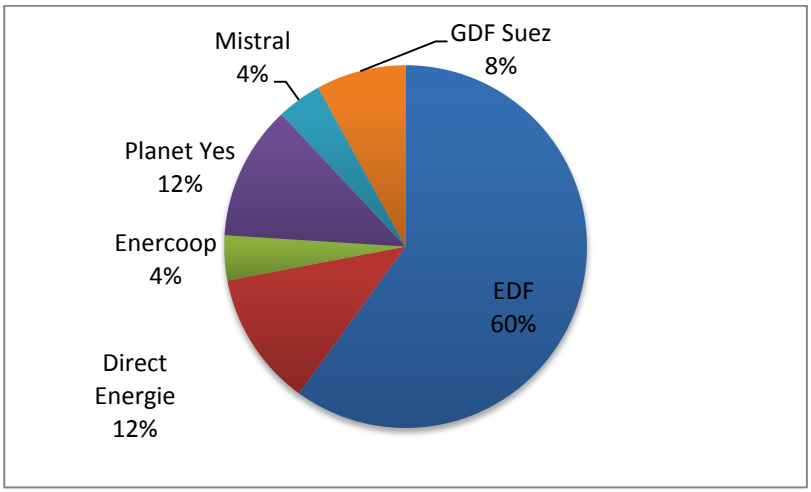
7. Who would be involved in the decision?
    - Board
    - Directors
    - Purchasing Department
    - Accounting service

    Others
8. Where would you look for informations about electric competitor offers?
    - Internet
    - Call to the provider customer service
    - Go to one provider office
    - Independant Consultant
9. If your company has a special policy or communication strategy for the ecologic matters?
10. Do you know that some electric providers propose electric which is 100% from renewable energies such as Wind, Wave or solar?
    - If yes, where did you get this information?
    - Internet
    - Television
    - Newspaper
    - Word to mouth
    - Others
    - If yes or no: what could be your brakes to change for a green electric supplier?

11. What are or would be, your motivations to change suppliers to consume 100% green electricity?
    - The price,
    - Branding,
    - Environmental awareness
    - Other
12. What would be the price increasing that you would be willing to accept to consume 100% environmentally friendly electricity?
    - 5%
    - 15%
    - 20%
    - 30%

B. Analysis of the results

a) Question 1: "Who is your current electric supplier? »

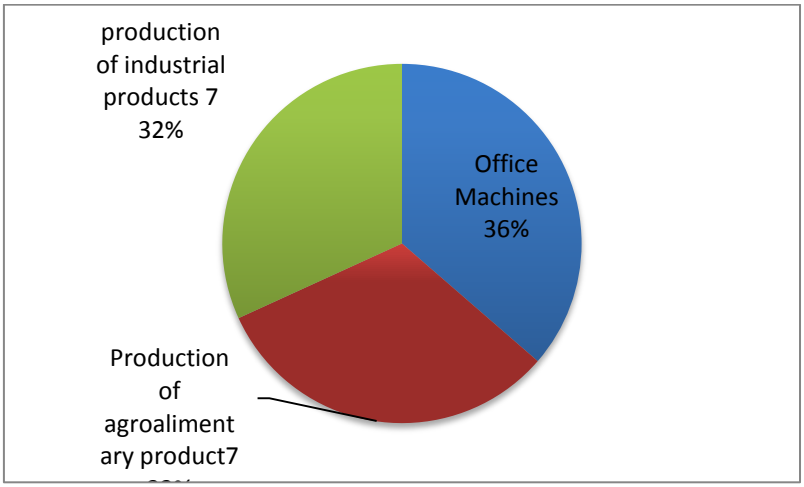


Thanks to this graph we can determine the market share of the French Electricity Market, however, for such a small panel (25 responses), the distribution of suppliers is not so far from reality. Indeed, according to the Commission of Energy Regulation, energy in its report "Observatory of Electricity and Natural" for 2013, the market share of historical suppliers (EDF, GDF Suez) is 91% and 8% for alternative suppliers (Direct Energie Enercoop..)

b) Question 2: "What is the size of your exploitation?"

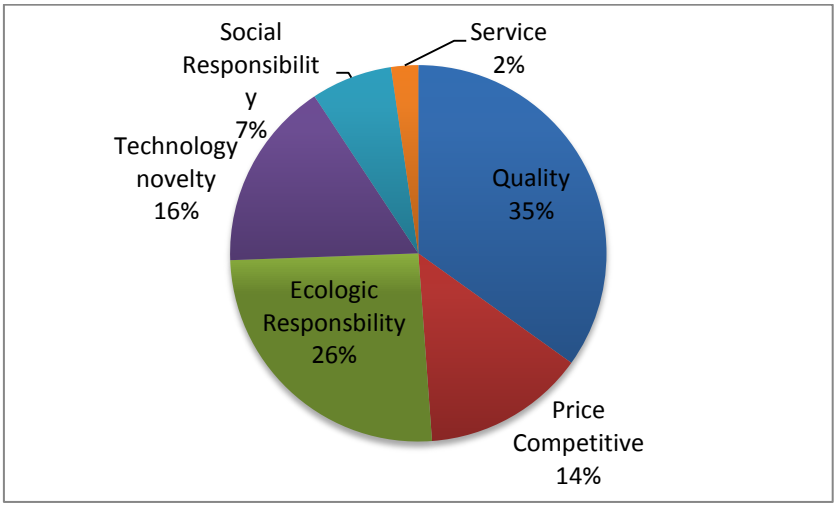
Thanks to the data analysis we can determine that the average size of the companies interviewed is 45 employees. The average number of employees in the primary sector companies is 18, 20 for the services sector and 101 for secondary sector.

c) Question 3: "Do you have energy-consuming machinery?



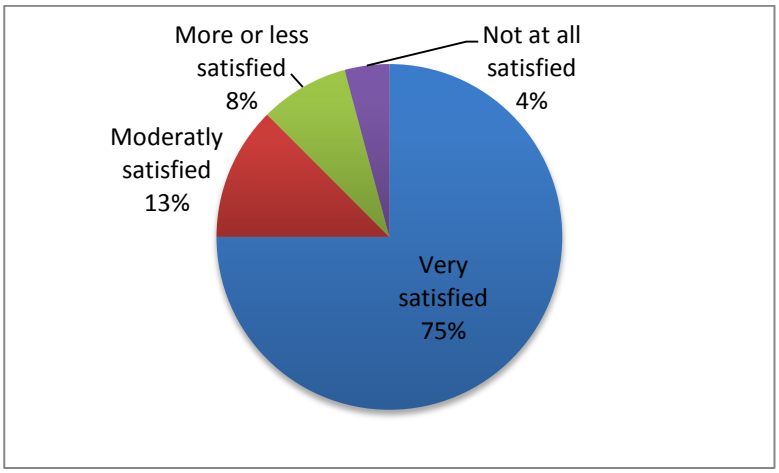
The graph above, higlights us on the origin of the power consumption of the companies surveyed. Datas here are obviously divided between services sector whose main source of consumption comes from "Office Machines" (computer, light, heating, air conditioning), the agro-food production for the primary sector and industrial products for the secondary sector.

d) Question 4: "Of the following image parameters which do you consider most important for your company"



e) Question 5: "What is your level of satisfaction in relation to your current electricity supplier?

Here, the analysis of this question, allow us tu say that customers are 75% very satisfied with their current electricity provider, and 13% said that they were moderately satisfied. We'll analyze just after this section the reasons for satisfaction and dissatisfaction of these customers.

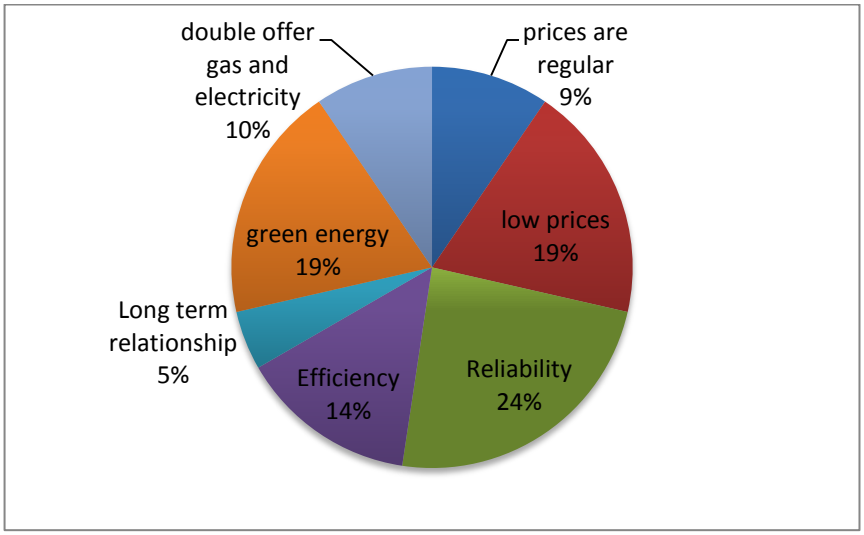


f) Reasons of high satisfaction

The reasons for satisfaction are numerous, the mainly reasons are:

- Reliability: indeed, companies surveyed are satisfied with its suppliers because they are very reliable, that mainly concerns EDF's or GDF's customers (68% of those surveyed customers at EDF or GDF Suez).

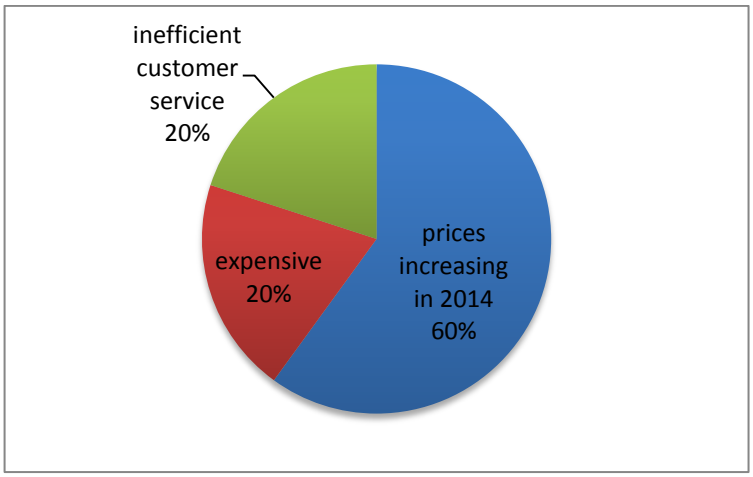
- The price, companies which have responded "Price" are clients of Direct Energy but not all. Other companies surveyed, said that the electricity in France is cheap even with historical suppliers, this statement was mostly expressed by companies from industrial or services sectors.
- Green Energy, a small part of the companies surveyed were already consuming green energy and that was the reason for their satisfaction.



g) Reasons of low satisfaction

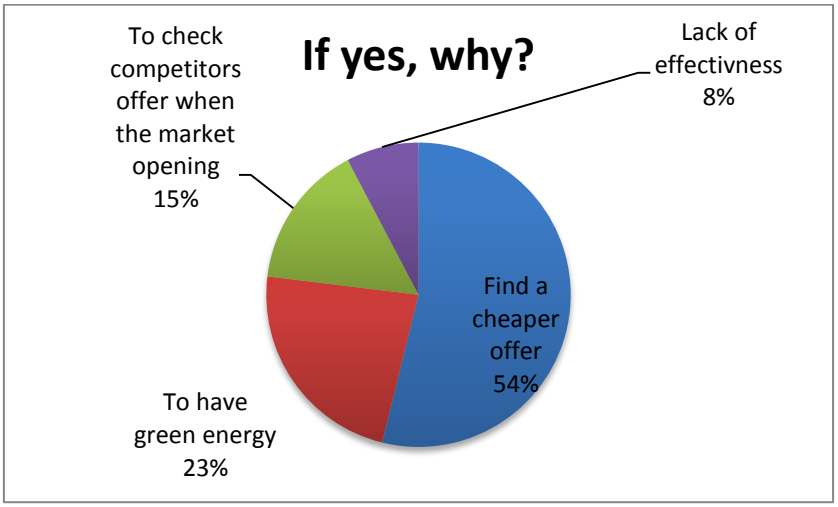
On the other hand, 25% of respondents who did not feel completely satisfied explained by several factors:

- Increase in prices in 2014, in fact regulated electricity prices will increase in 2014.
- Expensive, some companies feel that electricity in France is too expensive now.
- Inefficient customer service.



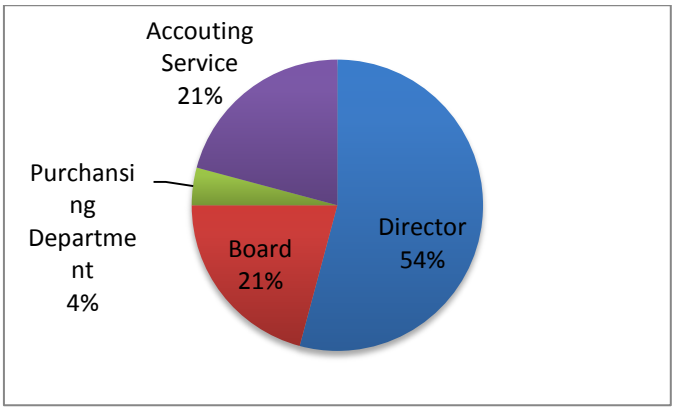
h) Question 6: ”Have you ever consider change your electric supplier?”

A third of the companies surveyed have already thought to change their electricity supplier. It is important to determine why these companies have desired switching. 54% of respondents wanted to change providers to find a cheaper offer; the majority of these come from the service sector and industry. 23% of those surveyed changed their supplier; to use green energy and 15% of them looked the competitor’s offers during the market opening in 2007.



i) Question7: "Who would be involved in the decision?"

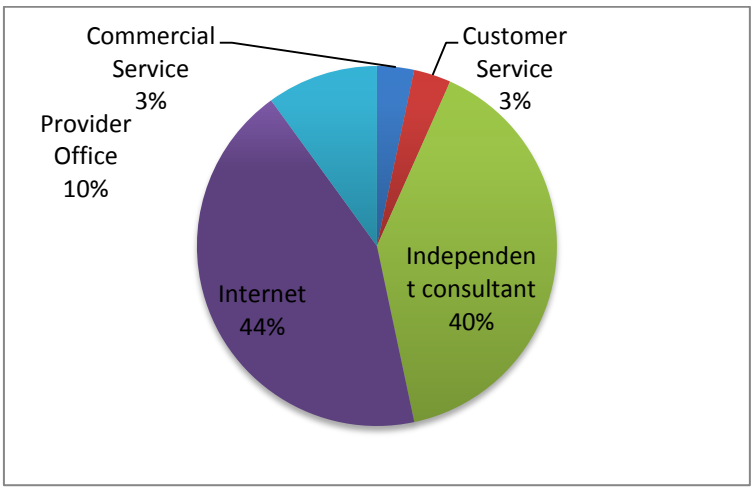
The key person in the decision-making process of electric supplier changing is for 54% of interviewed companies, the director. It is this person that the company should convince to change supplier, because it is the on who takes the decision. However in this study we also found out that companies which involve the board of direction, or the accounting department in the decision-making, are for a vast majority large businesses. This is something to take into account for the future commercial strategy of the company.



j) Question 8: "Where would you look for information about electric competitor offers?"

To search for information on competitors, companies surveyed would use for 44% Internet and 40% independent consultants, comes next commercial service, customer service and office suppliers. This highlights on the process of that the company does to find

informations. It is also to determine the information selected by the companies according to their economic sector to see if there are differences between companies in different sectors.



Thanks to the response's segmentation, we can see that the companies from primary and secondary sectors will be more inclined to use the Internet tool while firms in the secondary sector will instead use the services of an independent consultant. There is also a correlation between the number of employees in the company and how to search for information. In fact, the average number of industrial companies is 100 (higher than for other sectors) and these companies will focus on independent consultants, while primary and tertiary companies with reduced staff will instead use the internet before the independent consultant.

Primary		Secondary		Tertiary	
Internet	60%	Independent Consultant	67%	Internet	67%
Independent Consultant	30%	Commercial Service	11%	Independent Consultant	14%
Provider Office	10%	Internet	11%	Provider Officer	11%
		Provider	11%	Customer	8%

		Office		Service	

We can see here, what are the criteria of the companies surveyed, in term of information channels.

Internet	Fastest and easiest way
Independent Consultant	Neutral analysis of my needs and professional skills
Provider Office	Best advices
Customer Service	To have a support in my decision
Commercial Service	To negotiate the price

k) Question 9: "Does your company have a special policy or communication strategy for the ecologic matters?"

All sectors	
Yes	No
60%	40%

100% of the companies in the primary sectorhave environmental policy because it are all certified "Organic Agriculture" by the European Union. We can see, however, that 38% of companies in the secondary and tertiary sector have Environmental policy in their company, it refers to the recycling, manufacturing of ecological products, communication on sustainable development or the business which supports CleanTech through business incubators.

Secondary and Tertiary Sector	
Yes	No
38%	62%

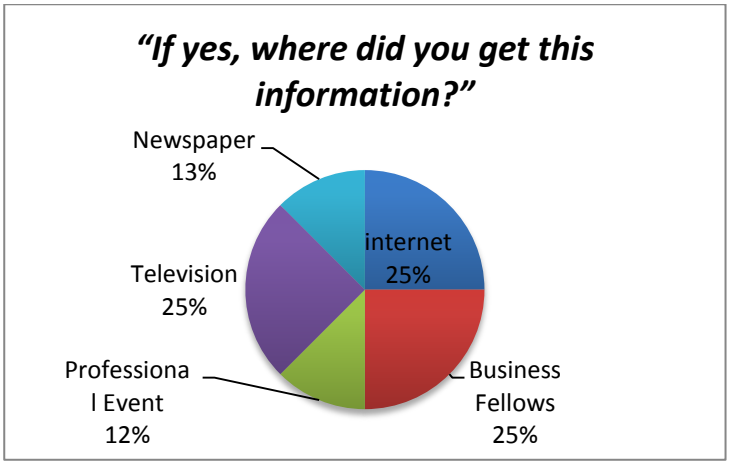
l) Question 10: "Do you know that some electric providers propose electric which is 100% from renewable energies such as Wind, Wave or solar?"

Yes	No
60%	40%

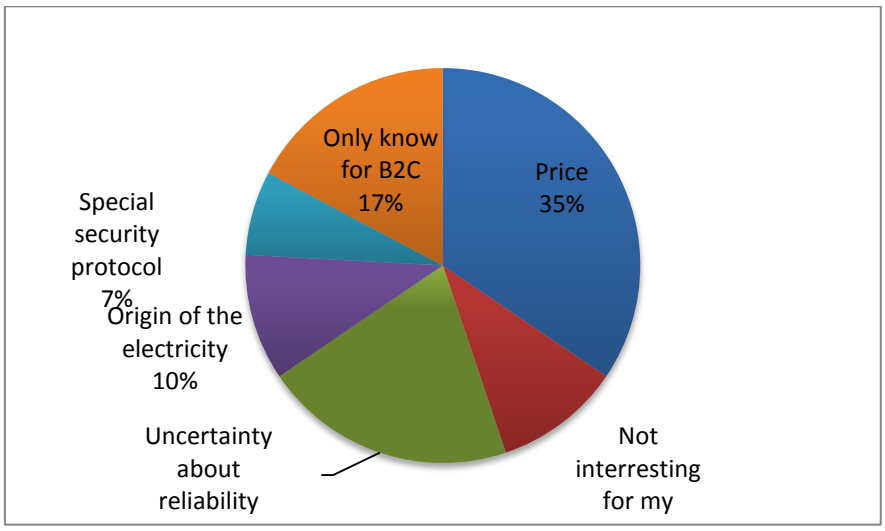
We see that 60% of respondents are aware about green electric supplier but as we will see later, companies' interviwed have a lack of information since many companies felt that these offers were only for B2C. We can see that 87.5% of firms in the primary sector knew about green energy deals.

Primary		Secondary		Tertiary	
Yes	No	Yes	No	Yes	No
87,5%	12,5%	50%	50%	50%	50%

Knowing where respondents have had the information about green energies offers is an essential element that allows us to determine our future communication strategy by using the most popular communication channels among our target.



m) "What could be your brakes to change for a green electric supplier?"

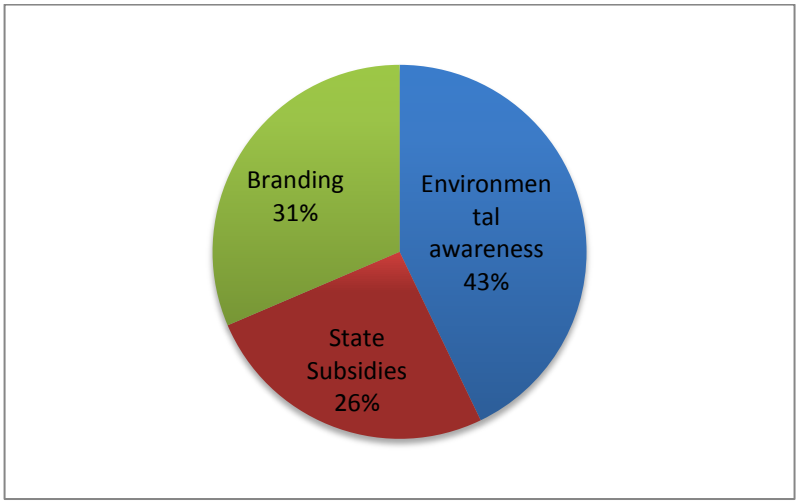


The main brake of green electricity is for 35% of companies surveyed, the price, this figure rises to 57% for companies in the service sector. Another important brake is the uncertainty regarding to the reliability of green energy suppliers, indeed consumers are afraid of having Power cuts; 17% of those surveyed knew the green energies offers but did not know, that it were valid for the professionals, this figure reaches 45% for firms in the primary sector. This data points to a serious lack of communication in green electricity market currently. The other two green electricity brakes according to companies surveyed are the origin of the electricity, companies actually want to check that the energy is green and finally some high tech industrial companies have very strict security process that not all electricity suppliers can not handle.

Primary	Secondary	Tertiary
Brakes		
Only knew for B2B: 45% Price: 22% Electricity Origin: 22% Uncertainty about reliability: 11%	Price: 37% Uncertainty about reliability: 25% Security Protocol: 25% Origin of the electricity:	Price: 57% Not interresting for my Business: 15% Uncertainty about reliability: 14%

	13%	Only knew for B2B: 14%

n) Question 11: "What are or would, be your motivations to change suppliers to consume 100% green electricity?"



The main motivation of the companies surveyed to change to a green electricity supplier, is the environmental awareness for 43% of the panel, this figure rises to 53% for firms from the primary sector. It is a key fact because it shows that companies have a real ecological approach to change for green energy. The Branding comes second to remember us that although green electricity is above all an ecological approach is also a marketing strategy, branding is the second source of motivation for companies from the primary sector with 40%. A third motivation showed up during the questionnaire, is the state subsidies, indeed the companies are willing to consume green energy if the state subsidizes this electricity, the state grant is the first motivation of the tertiary sector with 50%.

Primary	Secondary	Tertiary
Environmental Awareness: 53% Branding: 40% State Subsidies: 7%	Environmental Awareness: 37% State Subsidies: 36% Branding: 27%	State Subsidies: 50% Environmental Awareness: 30% Branding: 20%

o) Question 12: "What would be the price increasing that you would be willing to accept to consume 100% environmentally friendly electricity?"

Primary	Secondary	Tertiary
23%	12%	11%

Companies with Environmental Policy	Companies without Environmental Policy
22%	8%

p) Conclusion of the Questionnaire

(1) Targets are not always easy to approach

Thanks to this questionnaire the first thing we can determine is that it is not easy task to make a telephone questionnaire. Indeed we suffered many refusals even though the questionnaire had no business purpose and was an university project, companies didn't have the time and no desire to answer to our questionnaire, this is especially true in the Paris area where businesses were more reluctant to answer to our questions than in any other of the three regions where we have made the questionnaire. The situation has improved with industrial companies from the Rhone Alps region where we had few refusals and in the agricultural and agro-alimentary sector in Midi Pyrenees, all businesses that we have called, have answered to our questions.

(2) An ecology trend already present in France

There is already an ecological trend in France, it is visible with the questionnaire indeed, 60% of business surveyed already knew about the green electricity offers, over 43% of companies say that if they change their offer for consumption of green electricity, they would motivated by environmental awareness, it demonstrates a genuine approach and awareness about ecology from French companies.

(3) Customers are very satisfied

75% of surveyed ccompanies felt very satisfied about their current electricity supplier, showing that the current offer is suitable for consumers. The main sources of satisfaction are the reliability (24%), low prices (19%) and efficiency (14%).

(4) The power of historical suppliers

In our survey 68% of companies are clients of historical suppliers, in fact these suppliers have 91% market share in France. In addition they have a very strong brand image, EDF for people interviewed is synonymous with reliability and efficiency, besides the 14% of customers who are very satisfied about their supplier of electricity because it is effective and 24 % are satisfied because their supplier is reliable are all customers at EDF and GDF Suez.

(5) Still some fears from the Consummers

The main brake of green electricity is for 35% of companies surveyed, another important brake is the uncertainty regarding to the reliability of green energy suppliers, indeed consumers are afraid of having Power cuts; 17% of those surveyed knew the green energies offers but did not know any simply that they were valid for the professionals. This data points to a serious lack of communication in green electricity market currently.

(6) Ecological strategy

Many business with no ecological strategy answered that they were not interested by this type of energy because it doesn't give them any returns in terms of business, especially companies in the secondary sector, who explained us that in addition to the benefits to the ecology consuming this type of energy should have an impact in terms of business for these companies and there was no impact because their activities were not related to the environment and ecology. In addition we can see that companies that are specialized in the environment and has an Environmental Strategy will be ready to spend more money for green energy compared to companies with no relationship with the environment.

(7) Subsidies

One of the surprises of the questionnaire concerns the reasons that companies may have to consume green electricity, we had planned that the three main reasons would be: price, environmental awareness and branding. But we had not thought about state subsidies, and yet it is one of the most answered motivation response, with 26% of the companies,

which claim to be ready to change to green electricity if the state gives them financial assistance in return.

(8) Our Target Group

With the data analysis above, it seems evident to us that the customer segment with the greatest opportunities for our future business is the primary sector companies because these companies are already thanks to their activities in the field organic agriculture, abreast of green electricity offers, moreover their brakes to change for green energy relates to a lack of information, the origin of the electricity and reliability (brakes which are surmountable by marketing and communication); finally it is this group of customers who accept the largest price increase for the purchase of green electricity with 23 % increase. Firms in the primary sector, with an average size of 18 employees (the size of the company doesn't matter in this sector because the production is automated and therefore consumes energy) with Environmental Policy (organic certifications for example) will be our core targets. Nevertheless, the Midi Pyrenees region was only a market test for the study and we will be now focusing on all the French market for our target.

However, we target a very small segment of the French potential customers, moreover we can hypothesize that other economic sectors have also a business potential for our company, indeed, we found out that companies from all sectors with Environmental Policy was ready to accept a 22% increase in prices for green energy (by this way showing a real interest in this energy), while firms with no Environmental policy were ready to accept an increase of 8%. This is why we have made the decision to pursue a policy of expansion of the customer target very fast to find customer profiles similar to that of organic companies in the primary sector (which represents our core target), this strategy will be developed in the development plan.

(9) Our Communication Strategy

Thanks to customers motivations (why they would change to a green electricity supplier), where the target find information about offers and who would be involved in decision process, we can determine our communication strategy, communicate about what and with which communication channel. The communication plan will be explained in details in the “Marketing Strategy” part.

Regarding to the multicultural aspect of our group we choose to make the same questionnaire that we did in France, for Spanish companies to see if Spanish Electricity Market could strategic to implement within few years. But we found out that Spanish Companies are not very open to consume Green Energies, and this for many reasons:

- Indeed, thanks to the analysis of the questionnaire that you can find in the appendix, we can see that only 20% of respondents know the existence of green electricity offers, but mostly 90% of them stated that their sole motivation for change for green electricity would be lower prices. Over 90% of companies surveyed say they are ready to spend only between 0% and 5% more for green energy.

II. Competitors' analysis

The objective of this section is to define the current state of competition in the market for electricity suppliers. To determine the strategies of competitors that provide renewable energy but also those that provide traditional energy, we will analyze the following elements:

- The commercial offers to B2B
- The marketing strategy of competitors
- Their communication strategy
- Their approach in relation to their website
- The additional services offered

This analysis will allow us to both know the forces present on the market and take inspiration to build a marketing strategy,. Price proposals-have-been provided by the government website "Energy Info".

1. French Electric Suppliers

a) GDF Suez

Image 3:GDF's logo

GDF Suez is the second global largest energy group, according to (Fortune 500 2013) in terms of turnover and the leading independent producer of energy in the world since its merger with the British electrician International

Power in 2010 (Reuters 2010). The group was born July 22, 2008 from a merger between Gas de France and Suez. In 2013, GDF Suez had over 138,200 employees in nearly 50 countries worldwide and annual sales of € 84.5 billion (Wikipedia 2014). GDF Suez is best known for hits work as a gas supplier (GDF means “Gas of France”), but the company also offers commercials electricity offers.

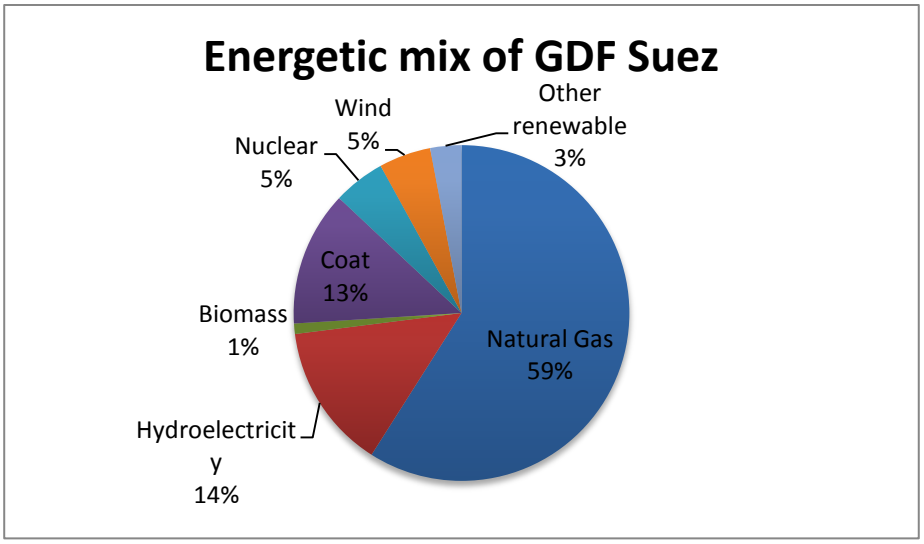


Figure 45 (GDF Suez Corporate website 2012)

(1) GDF’s Marketing Strategy

After its 2008 merger with Suez, the new GDF Suez Group has decided to intensify its activities in the field of electricity to compete with its rival, EDF. The goal is 2 million customers in 2012 (Professional Marketing 2013). GDF Suez uses its great image of “Historical Supplier of the market” to attract customers who sees in GDF safety and expertise. According to (Financial life 2012), GDF SUEZ is one of the few energy companies able to meet the entire customer needs (water, gas, nuclear, cogeneration and renewable energies), thanks to its energetic mix.

(2) Commercial offer for B2B: E-Dolce

According to (Energies Infos 2014), GDF Suez proposes an offer for businesses called "E-dolce" the offer proposes electricity, which comes from for 100% of non-renewable energy. Annual subscription is €693,80. The price per each Kwh is about €0,120 /Kwh.

(3) Communication of GDF Suez

According to (Strategies 2012), GDF Suez decided to reshape its communication strategy in 2012. The aim was and still is to:

- Increase awareness of its brands while enhancing the competitiveness of its offer to all its customers.
- Increase business performance through better awareness of GDF Suez while relying on simplified brand architecture.

(Strategies 2012), Says in its article that the energy group spent €93,5 million in the media in 2010.

To overcome its objectives, the company decided to take a series of measures to make the firm more interactive and modern (GDF Suez Corporate website 2012):

- Comprehensive overhaul of the corporate website www.gdfsuez.com: The corporate website of GDF SUEZ relies on a new digital identity in accordance with the new graphic chart of the group.
- Standardization of all Group sites.
- Creation of a WebTV.
- Mobile site creation.

(a) Websites of GDF Suez

The company has three websites, each with a clearly defined target, here the role of this part is to analyze the formation of the websites and through that the digital communication strategy of the firm.

- Corporate website

According to (Blueacacia 2014) which is a French communication agency, the role of a corporate website is to:

- Raise the customer loyalty.
- Be interesting before interested.
- Being factor of cohesion internally.
- Facilitate recruitment.
- Inform and serve.

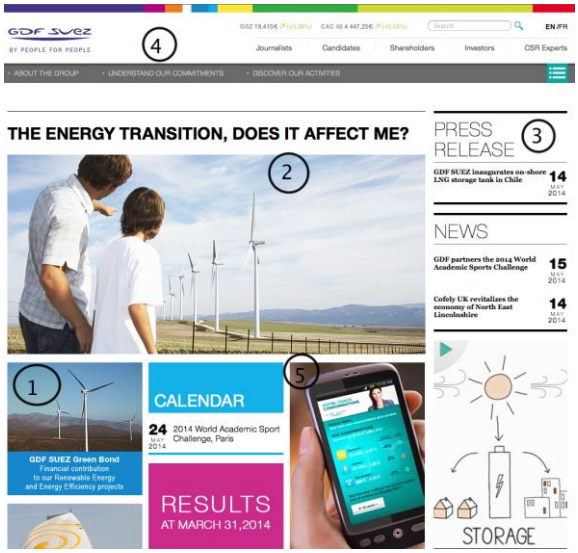


Image 4: Corporate website of GDF Suez

- In Part 1 of the website, the company communicates about its activities in renewable energies and particularly on wind energy because GDF Suez is the leading company in terrestrial wind turbines with more than 16% of the production capacity installed in France (Challenges 2012).
- In Part 2, the company asks visitors of the website with the tagline "The energy transition does it affect me?" we will see later with the example of the GDF's communication campaign that this sentence is not trivial and it is well and truly part of the communication campaign of GDF Suez in the context of energetic transition in France.
- In Part 3, we can see a flow of information about GDF Suez, at the external level with press articles, but also at the internal level with the "news" section where the company offers it own articles about the breaking news of the market or the firm herself.
- Thanks to the 4th section we can determine the target of the website which are, Media organization, journalists, candidates to a job, shareholders, investors, potential investors, customers or potential customers.

- B2C Website

On the B2C site GDF Suez, the emphasis is on economic competitiveness of offers and services proposed by the company for individuals. The user has the option to change providers directly trough the website and have access to a personalized offer based on its consumption and its places of living. The supplier also highlights online services and tariff

promotions. Moreover, GDF does not lose it's advising objective, with an entire part of the website dedicated to advices and interactions with call center. This site has a purely commercial purpose:

- Inform on business offers
- Convince the potential customer to change supplier for GDF and make it, within few clicks
- Information on additional services
- Access to customer account users GDF Suez with all services included (online bill)

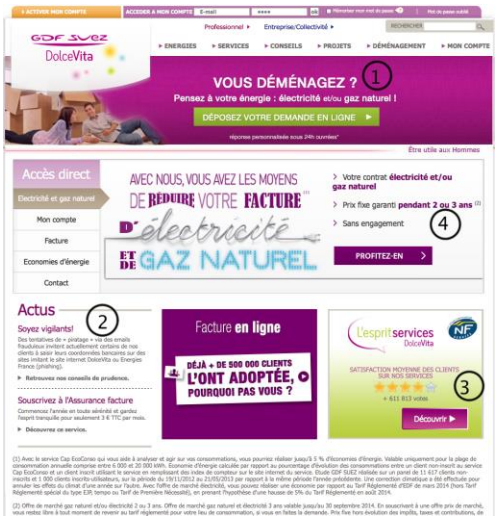


Image 5: GDF's B2C website

- B2B Website

The B2B website GDF Suez is very different from B2C in fact the site is much more sober, there are no commercial offer highlighted, it is not possible to contract online for GDF Professional offers, the professional user must either go through a telephone advisor or by email. GDF Suez also remains very discreet about his services only few commercial commitments are highlighted as: a dedicated teleconsultant who will remain the same during the contract process, the personalization of electricity supply (while the list of services offered is quite long, they are not emphasized in the communication of the website, compared to B2C commercial site or to EDF communication). Those commitments remain still very vague compared to B2C site that is much more detailed, we could make the hypothesis that the company want to explain in detailed the different offers by telephone or mail because the contracts for Businesses are much more technical than the B2C contracts.

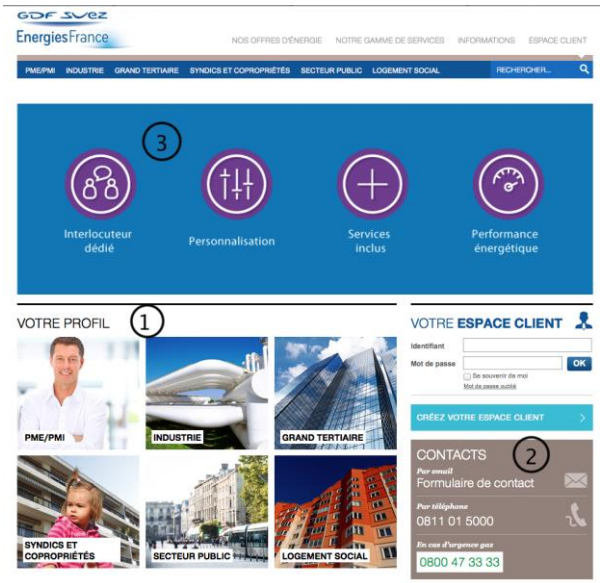


Image 6: GDF's B2B website

The B2B website GDF Suez is very different from B2C in fact the site is much more sober, there are no commercial offer highlighted, it is not possible to contract online for GDF Professional offers, the professional user must either go through a telephone advisor or by email. GDF Suez also remains very discreet about his services only few commercial commitments are highlighted as: a dedicated teleconsultant who will remain the same during the contract process, the personalization of electricity supply (while the list of services offered is quite long, they are not emphasized in the communication of the website, compared to B2C commercial site or to EDF communication). Those commitments remain still very vague compared to B2C site that is much more detailed, we could make the hypothesis that the company want to explain in detailed the different offers by telephone or mail because the contracts for Businesses are much more technicals than the B2C contracts.

(4) Communication campaign of GDF Suez

GDF SUEZ launched a new advertising campaign in France in October 2013 (GDF Suez Corporate website 2012), where the company opened a dialogue with clients or potential clients. The emphasis is on a direct exchange between the public and the employees of GDF SUEZ. Consumers can ask questions to the firm trough the corporate website,

related to its field of activity and the current energy transition in France, the group has committed to answer all questions and some of them will be use for advertisement.

Image 7: Example of GDF's ad

In the advertisement, the dialogue is represented by a key visual: two puzzle pieces that fit together, one concerning the questioning of consumer and the other providing the response of GDF SUEZ.

To conclude on the communication of GDF Suez, trough the analysis of websites, the communication strategy and communication campaign, we can say that the company through it's communication follow its marketing strategy and positioning by playing it's role of major player in the French energy market; GDF Suez is an old and well known French company, it is as well one of the global leading energy company, and moreover as explained in the part "Opening of the market", during almost 50 years GDF and EDF were in monopoly situation in France. Thanks to those factors the company has a strong brand image among the French consumers, who trust in it. The company uses it by playing a paternalistic role in advising clients in their questioning.

The communication approach of GDF Suez is visible in:

- It's latest advertising campaign where process of dialogue through advertising creates a more direct and personalized relationship with consumers.
- It's new communication strategy from 2010 where the goal was to modernize the communication of the group thanks to ICT and make the information supports of the firm more clear and concise for consumer.
- Finally the approach is also visible in the websites of the group, for example on the corporate website of the company, GDF Suez still plays the role of advisor with the sentence " The energy transition.

b) EDF

Image 8: EDF's logo

"Electricity of France" (EDF) According to (Le point 2013) is the biggest electricity producer in France and in the world, in 2013. In 2012, the turnover of EDF was € 71.7 billion, the company has made 46.2 % outside France (Le point 2013). Nuclear power accounted for 79.6% of its production in 2011, with a fleet consisting of 58 nuclear reactors in operation in France, and 15 reactors in United Kingdom (EDF 2012).

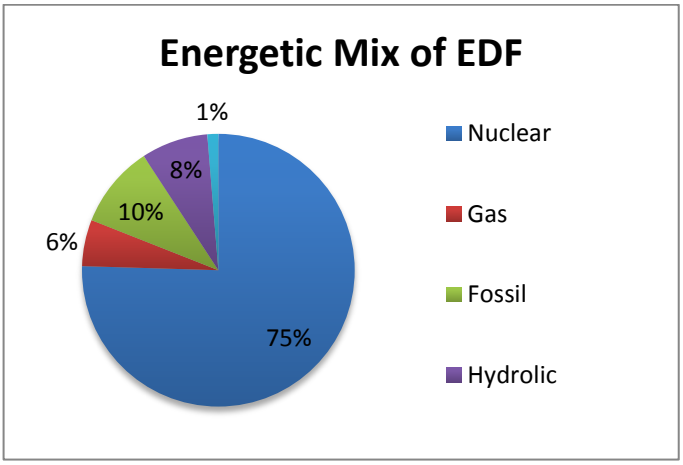


Figure 46: (EDF 2010)

(1) EDF's Marketing Strategy

The opening of the competition in 2007 has changed the situation in the energy market, EDF and GDF are no longer in monopoly situation, and the balance of power has shifted in

favor of customers. As stated by (Chibout 2009), in its report about the new marketing and communication strategy of the group, EDF has gone from a marketing strategy oriented on offer (monopoly) to demand and service oriented.

(2) Commercial offer for B2B: “Blue Offer”

According to the information provided by the government website, (Energies Infos 2014). EDF proposes an offer for businesses called "Blue Offer" the offer proposes electricity, which comes from rom 9% of renewable sources and 91% from nuclear power. Annual subscription is 705 € plus various taxes (taxes represent a 20% surcharge on the price of Kwh). The price is € 0.115 Kwh, the company follows the rate regulation organized by the government.

To embody this new position, the company created the brand " Blue Sky." The message of this brand is better live at home, as (Chibout 2009), said "EDF helps the client to find a balance between well-being, economy and energy through the many services that the company offers, as energy consumption, but also insulation and renovation.” The services offered by the company will be listed in the " Services offer by competitor's "

Those services are part of a new marketing strategy clearly oriented services and customer relations (Chibout 2009). It is clear that despite this change in strategy, EDF has an identical positioning has GDF Suez that is to say the image of incumbent supplier, reliable and secure. However, EDF is now different from its competitor with this new marketing positioning, services oriented. According to our analysis the company is aware that in competitive environment, its strong brand image is not a sufficient asset to keep a long-term leadership. Thanks to this statement, EDF now justifies a higher price compared to the competition by quality and quantity of services, all with a very strong brand image that promotes customer loyalty.

(3) Communication of EDF

According to the (French Advertising Observatory 2011), EDF is the 33rd announcer of France in 2011 with a communication budget of € 118 million, distributed as follow.

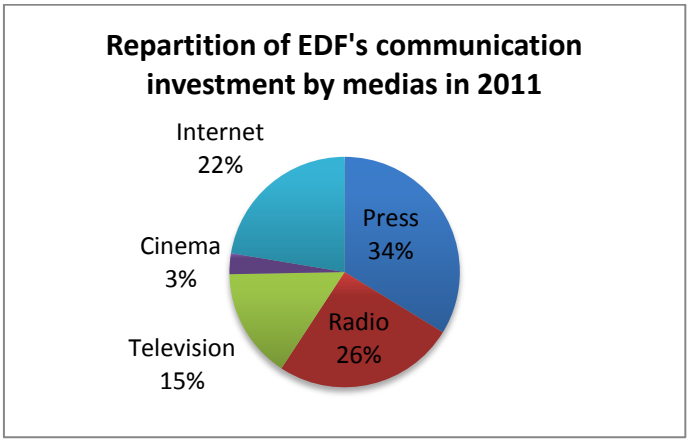


Figure 47: (French Advertising Observatory 2011)

Following the opening of the French electricity market, EDF has revised its marketing policy and therefore necessarily its communication policy, both policies are interrelated and interdependent. According to Morad Chibout, Executive Director of B2B and B2C Marketing & Communication at EDF, the new group's communication strategy focuses on several points:

- Retain high-value customers while maintaining a high level of satisfaction.
- Increase revenue and margin per customer, through the establishment of new commercial offers.
- Focus commercial communication on additional services provided by EDF

(a) EDF's websites

- B2B and B2C commercial website

EDF takes a different approach with its websites in comparison with the other historical operator, GDF. EDF has only one commercial site for its B2B and B2C target. The commercial site is fairly simple, with few attention-catcher; EDF tries trough it's commercial website to go to the essential namely define its offers and online services; this approach is as well in accordance with it's service-based marketing strategy. It is not possible for B2B consumers to purchase an online contract, the user should get in touch with tele-consultant by phone, email but also chating with a counselor directly through the website. EDF on its website also focuses on its latest innovation, a smartphone application that lets

the customer has full access to the associated services. Moreover the site has sections that explain one by one the services offered by EDF.

Image 9: B2C and B2B commercial website

- EDF's corporate websites

The approach of EDF concerning its corporate communication is also different. In fact, the company has two corporate websites one at the global level and the other at France level. Target of the sites are almost identical:

- Media organization, journalists, candidates to a job, Shareholders, investors, potential investors at international levels.
- French customers or potential customers, media organization, journalists, candidates to a job, Shareholders, investors, potential investors in France.

The French corporate website of EDF is more focused on the French industrial activities of the group, the company also discloses in it's website that the company produces, low carbon electricity, thanks to nuclear energy, the same energy which is also highlighted in the site with an entire part dedicated to the activity of french nuclear plants, the user can even follow up the activity of the nuclear centrals online. The French corporate site acting as a relay to bring the user to the EDF commercial site. We can therefore say that the corporate website of the company has information function for its different targets (a corporate website's primary objective), but also information function at the national level, intended to french customers or potential customers of the company and finally a function of sales support.

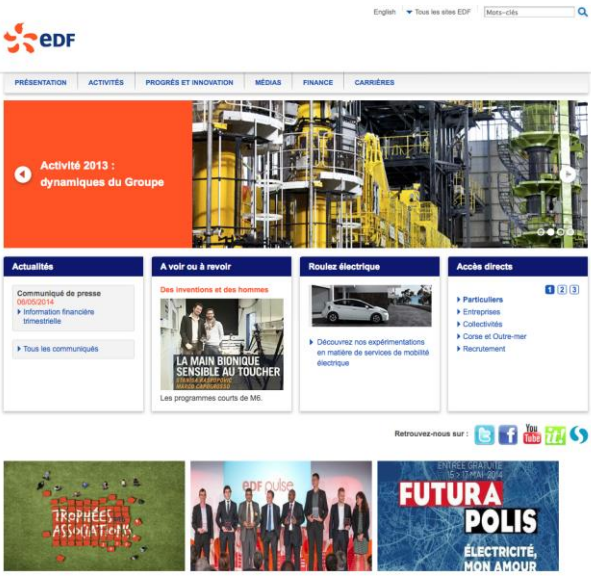


Image 10: EDF's French corporate website

EDF's international corporate website, filled the function of general information about the group's activities in the world, the group's values and accurate information based on the target as the financial results for the shareholders or investors group.

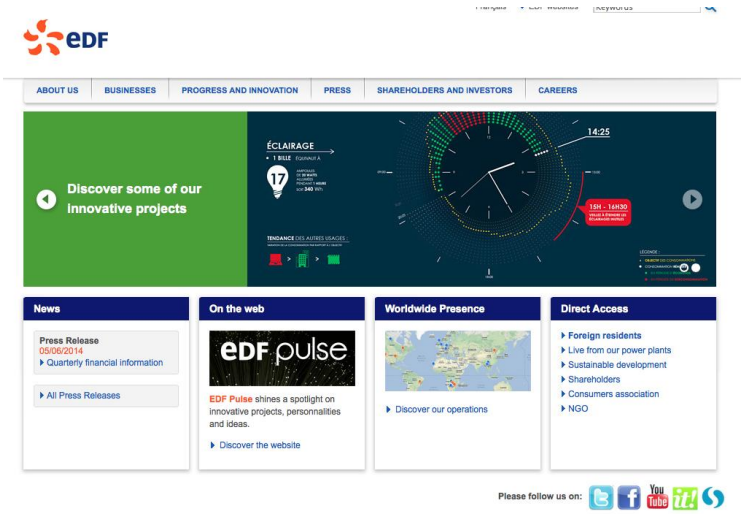


Image 11: EDF's global corporate websites

(4) Communication campaign of EDF

EDF launched in autumn 2013, "EDF Pulse", a new multi-channel communication campaign aimed to promote initiatives from the group. EDF also included in its "Pulse project" a part aimed to supporting innovative projects developed by men and women internationally by the intermediary of Innovation Award (CB News s.d.). This part of the « Pulse » initia-

tive is not officially part of the communication campaign but we can hypothesize that the Innovation Award also serve the company in terms of branding and communication tools.

Image 12: EDF's Pulse campaign

The information website "CB News", informs us about the communication channels used for this campaign :

- TV spot, directed by Yvan Attal (french movie realisator), the spot will stage, EDF's employees engaged in innovative projects such as using wave energy or nuclear energy
- TV broadcast on the Internet in France and Europe, and then to the cinema.
- Press campaign and display will feature current innovations, for instance a field of offshore wind, a new eco-efficient lighting system Tower Bridge in London, or the construction of the new nuclear reactor of Flamanville EPR.
- The website www.pulse.edf.com, which invites people to share about the theme progress and technological innovations of tomorrow.

Image 13: EDF's pulse campaign ("The progress, we must believe in it to see it")

To conclude, thanks to its age and place of historical supplier, the company has a very strong brand image. This is also visible with its commercial site that remains sober in terms of attention-catcher. We could that this strategy it is employed by EDF because the company doesn't need to prove the quality of its offering to clients or potentials clients. (Chibout 2009) Says in his report that consumers already see EDF as an expert of electricity which provides safety of utilization. This is why the company focuses its communication on its close relationship and trust with consumers and its ability to provide many services, because it is in this area that EDF can make a difference with competitors and bring value added to its offer. As we figured out in the study, EDF communicates about its "low carbon emission" electricity, thanks to its nuclear production and the investment that the company does in the field of renewable energy. However this is not very favorable to EDF in terms of image as the use of nuclear energy is a controversial subject in France, we can say thanks to study of the EDF's communication that the firm is trying to change that through communication advocating ecology in his campaigns.

Nevertheless, as it can be seen with the latest communication campaign "Pulse", the the public see the company as an old brand, which is why she talks a lot about his group's innovations in all types of energy (nuclear, renewable). The company wants to show that despite the age of the group, the company has remained at the forefront of modernity to always deliver the highest quality services.

c) Direct Energie

Created in April 2003, Direct Energy is an independent power provider, funded among others by the BNP Paribas Bank. Direct Energy provides electricity to 1,000,000 clients, professionals as individuals (Conso Globe 2014). Direct Energy offers two special offers in electricity. The difference lies in the level of tariffs but especially in the energy mix (One-offer 100% green energies and another with 20% of renewable energies). In this study we will be focus on the non-renewable energies offer.

The company with a score of 7.6 out of 20 took the last place in the ranking of "Ecolo Watt Greenpeace". The main reason is because 84% of the total electricity produces by Direct Energie (both offers) came in 2009 from nuclear energy (Conso Globe 2012). Direct

Energy has an energy mix almost like EDF, and it can't be otherwise because the firm has bought 75% of the electricity to EDF in 2013 (Electricité-Verte.com 2012).

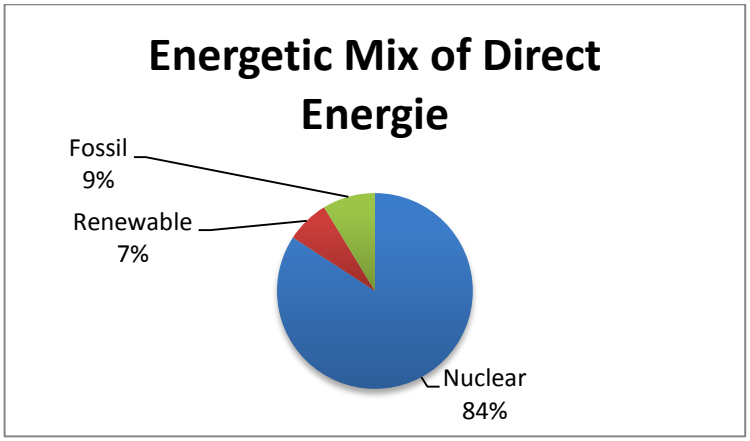


Figure 48: (Terra Eco 2009)

(1) Marketing strategy of Direct Energie

According To Armelle Balenceu, Director Marketing & Direct Sales in charge of customer service at Direct Energy, in its interview for the website (The Hub s.d.). Our strategy is focused on price, with offers 100% online where all interactions between the customer and the company are dematerialized in return of 10% prices reduction. Ms. Balenceu explains the positioning of the company "Because we can not rely on an old brand and recognized as the EDF and GDF Suez strategy; Our prices policy is 2 to 10% below the price of regulated tariffs, plus other reductions as the 10% of 100% online offer. "

In addition the company also follows the attraction of customers for renewable energy. The company commits to propose 20 % renewable energy in all its offerings, commitment of a tree planted by new customer. Thus, the company has planted a forest of 300,000 trees in Indonesia to fight against deforestation, according to the interview from (The Hub s.d.). According to our analysis, this strategy of Direct Energy for renewable energy can have two objectives:

- Arrival preparation of 100% green electricity offers.
- Marketing and communication actions to make forget that 84% of the electricity supplied by Direct Energie came from EDF's nuclear power plants in 2009.

These assumptions are further supported by the fact that the company has made a strategic shift to try to stand out from EDF and Invests to develop its own energy generation and began to invest in " green" projects. Renewable energy should represent 21% of its energy mix by 2015, (Conso Globe 2012).

(2) Commercial offer for B2B: "Free Spirit offer"

According to the information provided by the government website "Energy Information" Direct Energie proposes a business offer called "Free Spirit" with 15% of renewable sources of electricity and 85% from nuclear power. Annual subscription is 777,51 €. The price per kW is about € 0.110 / Kwh.

(3) Communication strategy of Direct Energie

According to (Electricité-Verte.com 2012), Direct Energie communicates mainly through Internet, with its own website but also through partnerships with various sites focused on the same "hard discount" strategy such Cdiscount.com which is a site selling a wide range of products with discounted prices.

(4) Direct Energie's website

Direct Energy does not have a corporate website and has only one commercial site used for both B2B and B2C. It is possible trough the website to make an online subscription for both B2C and B2B (unlike a historical operators), but it seems that for professionals contractual approach can not be made entirely on the internet, in fact the professional user begins to fill documents online and then a tele-counselor must recall the contractor to finalize the registration. The site includes many catchphrase, like "I chose" direct energy "in 5 minutes", the commercial arguments of these sentences are, the speed and ease of Direct Energy's subscription and the price difference in comparison with the competition.

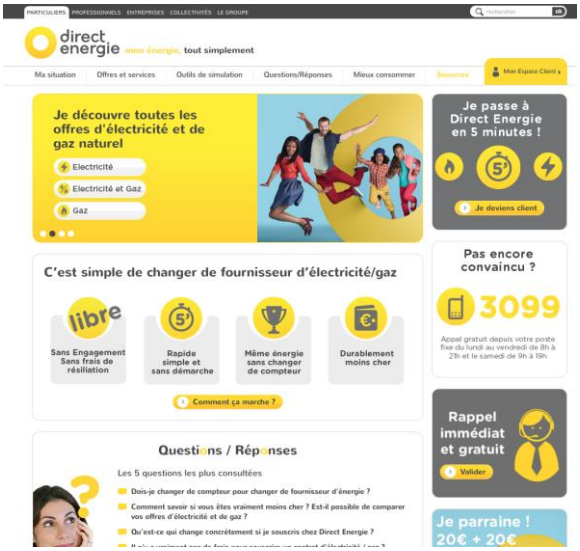


Image 14: Direct Energie's website

When the company has been created in 2007, Direct Energie set up a communication campaign based on humor, which consisted in using famous personalities acted in several comic gag on television and in the press. In the ad below the company staged a famous sport coach, Philippe Lucas, who has the reputation being very rigorous, he used to say "One point that's all!" to his athletes, and this fact was public and famous in France. In this ad Direct Energy uses the Philippe Lucas's "One point that is all" but by writing "The same cheaper electricity, and one point that's all".

Image 15: Direct Energie's communication campaign

Direct Energy is the sponsor of the football club "The Olympic of Marseille".

Image 16: Sponsorship of DE for a French Footbal Club

To sum up, Direct Energy trying a communication strategy totally opposite to the strategy of industry giants and we can explain this as a goal to stand out from the shadow of the historic operators, in fact the company put all its communication efforts on its first purpose "low price offerings". It also uses humor in its advertising and sports sponsorship to attract public sympathy and make the company known quickly.

2. French Green Electric Suppliers

a) Planet Yes

YES planet is the 2nd Alternative electricity operator in France after Direct Energie; it was created in 2007 with the opening of the market to competition (Conso Globe 2012). The Company defines her clients more as "consum-actors" because similarly with the offer of Enercoop, the potential customers of the both companies are people who are or want to commit more for renewable energy (Yes Planet Website 2014).

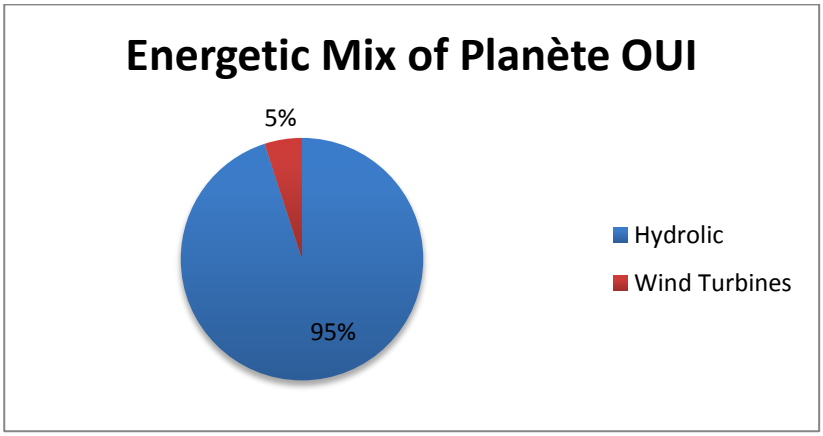


Figure 49: (Yes Planet Website 2014)

(1) Marketing Strategy of Planète oui

According to our suppositions, the company operates a "hybrid" strategy inspired by the traditional suppliers of electricity. Indeed, we can say that the company is trying to adapt the strategy used by Direct Energy (Price strategy) with the Specific character of green electricity. The company trying to compensate the higher prices of green energy by promotions, by this way "Planet Yes" wants make its offer more competitive, compared to the competitor's offers (both non-green and green suppliers). "Yes Planet" justified this choice by the difference between the regulated price and the green electricity price, making green elecricity less attractive (Terra Eco 2009). Yes Planet has established two special offers for consumers to decrease by 20% their electricity bill:

- "Électréconso": the subscriber declares his actual consumption each month, automatically provides 10% discount on subscription of the next bill. In exchange, Planet YES optimizes its forecast electricity purchases.
- "Électrécolo": YES Planet has established a reference level. If the customer does not exceed that level, he gains an additional 10%.

(2) Commercial offer for B2B "Free Spirit offer"

"Yes Planet" proposes an offer for businesses called "Yes Planète electricity 100% green" the offer proposes electricity 100% renewable, for an anual subscription of 705,51€ and a price of €0,133 /Kwh.

(3) Communication strategy of Planète Oui

Yes planet communicates only via its website and comparators electricity offers. However Planet has implemented an original communication campaign on its website, the operator committed to investing two million euros in the construction of a wind turbine, whose electricty production will be offered to all its customers without time limit, if 100,000 users subscribe to its offer before 1 July 2014 (Yes Planet Website 2014). A way to communicate about the company, win customers and also lower the customer's invoice and thus increase their satisfaction.

(a) Planète Yes website

Planet Yes does not have corporate website, its commercial site is both for professionals and individuals; it is possible for both parties to subscribe online, excpet for the companies

which has multisites of activities (those kind of companies have to meet up a member of the commercial team to have a customized offer). The majority of commercial arguments concern both the 100% electricity from renewable sources and the possibility to lowering the energetic invoice to 20% by taking advantage of promotions, as it has been presented before in the part “Marketing Strategy of Planet Yes”. The site also offers online services as “guide of ecological concommation”, an customer online account, or the possibility to chat with a customer service person directly trough the website.

Image 17: Planet Yes Website

The core communication of Planet Yes is about green electricity and price promotions, however, we can see thanks to the analysis of website that the company also seeks to assimilate the EDF's communication strategy services by communicating on many online services that the company offers.

b) Enercoop

According to the (French Green Electricity Portal 2014), the legal structure of the company is a Cooperative Society of Collective Interest (SCIC) and in the board of direction we can find associations such as Greenpeace or Friends of the Earth. Enercoop is the only French provider to supply exclusively and

Image 18: Enercoop's logo

directly from 55 French small renewable electricity producers (All the others green suppliers also buy a part of their electricity on EPEX Spot, the European electricity exchange. But the origin of the electricity buy on this market is sometimes cloudy according to (Terra Eco 2009)):

- 39 wind power generators.
- 11 solar photovoltaic producers.
- 4 hydraulic power generators.
- 1 producer of biogas electricity.

The cooperative guarantees that they inject as many of green electricity in the network as the individual consumes (Conso Globe 2014). The electricity supplied produces neither CO2 nor radioactive waste, but in return for a price 30% higher than the market (French Green Electricity Portal 2014).

The (French Green Electricity Portal 2014), says that at the end of 2011, Enercoop just crossed the threshold of 10 000 clients, but it still a very small actor in the market compares to giants as EDF or GDF Suez. However, the cooperative continues to gain 500 new subscribers each month since 2007.

According to (Conso Globe 2014), Enercoop is the first and only supplier in the market, which has obtaining the EVE, which is the most demanding label in terms of ecology. This label carried by the WWF, reward ecological approaches to power following criteria respecting the environment, the fight against the greenhouse effect and consumer protection.

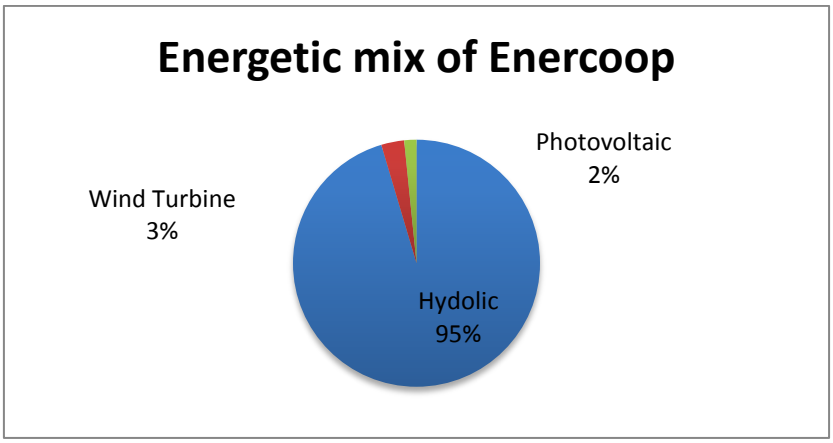


Figure 50: (Enercoop Website 2014)

(1) Enercoop's Marketing Strategy

Enercoop is clearly positioned as a private company of public interest. "This positioning is clearly committed: Enercoop does not purport to competitive rates but offers a "fair" price for transparent and support the development of renewable energies (French Green Electricity Portal 2014).

(2) Commercial offer for B2B

Enercoop proposed an offer for businesses with 100% renewable energy, for an anual subscription of € 1,000.95 and a price of € 0.140 / Kwh, the company does not follow the rate regulation organized by the government.

(a) Enercoop's website

The site Enercoop sharing the characteristics of a corporate website and a commercial site:

- The website has a major part dedicated to explain its approach, its values and its partners such as Greenpeace or WWF that are in the executive committee of the company.
- Commercially, the company has a single website for both targets (B2B and B2C), it is imposible for both categories to subscribe online; the user must fill out an application and send it by mail. Customers have a placeholder on the website or certain services should be offered but it is impossible for non-clients to access to this part people. The website's communication is based on the origin of electricity

supplied (green, 100% renewable) and the fact that Enercoop is recognized as Social Utility and Collective Interest Company by French State. In this way the company wants to communicate on the fact that Enercoop is more than a company wishing to make a profit but a citizens' initiative. The website is quasi empty of any commercial arguments concerning the price or the offer's subscription, only a section about customer testimonials is present to justify the quality of Enercoop service.

Image 19: Enercoop's website

(b)Conclusion of Enercoop's communication

To summarize, Enercoop, because of its involvement in associative and cooperative media related to renewable energy, got numerous relays to publicize its offer. Its position in relation to the energy challenges of sustainable development also allows it to stand without communication campaign in the mainstream media. It is on the ground, with specials events that the company can prove its expertise and its daily practice in favor of renewable energy to reach more customers.

As we said, the company does not communicate on mass medias. We hypothesize that this may be due to the fact that the target of the company is not in line with these types of channels. Indeed, thanks to the analysis of the site we can highlight that the company does not talk about the price in its commercial argumentary, if the company does not communicate about the price it may be because the Enercoop's target is not interested in the concept of price (to the extent reasonable), but rather by the origin of electricity, in fact its customers want the 100% renewable energy even if it is more expensive. That is why it is much better for Enercoop to communicate about its civic action and its renowned partners in the ecology.

c) Alterna

Image 20: Altern'as logo

Alterna is a local distribution company; the company is responsible for the distribution of electricity or gas and operating on a limited basis, as opposed to EDF, which provided a large part of the national territory. A dozen other small electric providers implanted in nine departments and seven regions have joined Alterna, the purpose of these structures is to unite their strengths to face giants like EDF (Electricité-Verte.com 2012).

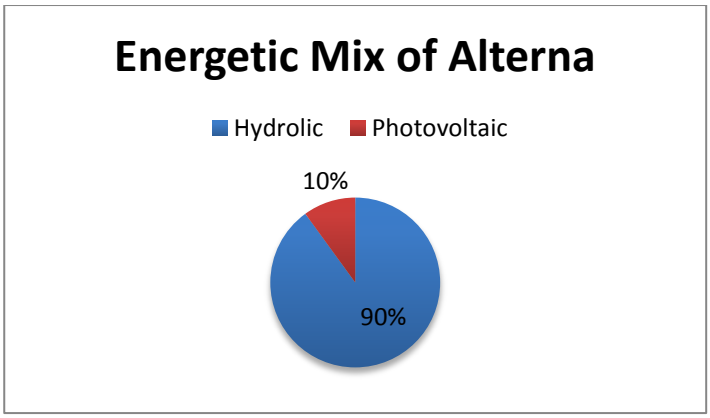


Figure 51: (Electricité-Verte.com 2012)

(2) Alterna's Marketing Strategy

With the electric market opening in 2007, competition increased and these small structures are caused to lose customers in their territory. (Conso Globe, 2012) says that the

response was therefore to gather under a single commercial structure: Alterna. By combining these small retailers, Alterna hopes to compete with the largest distributors nationally and compensate their loss of customers locally.

(3) Commercial offer for B2B: “Idea”

According to (Energies Infos, 2014), Alterna proposes an offer for businesses called "Idea Green". Annual subscription is €696,88 and the price per each Kw is about €0,130 /Kwh.

(4) Communication strategy of Direct Alterna

Alterna communicates thanks to its regional partner "Gas and electricity de Grenoble" (Electricité-Verte.com 2012), but the company does not make communication campaign on his behalf, the only channel of communication at its disposal is its website and comparators of tarfis electricity that reference its offer

(a) Alterna’s website

The Alterna website uses the same approach as Enercoop, namely a site both corporate and commercial. In the commercial part, its main argument is its small structure grouped around small independent producers. The company does not offer additional services and it is impossible to subscribe to the online offer.

Image 21: Alterna's website

In conclusion on Alterna's communicaton, it is quite hard to arrive at a definite conclusion because informations was not many and the company does not communicate a lot. We submit the hypothesis that Alterna uses regionals communication relay as price comparison websites or through various regional structures that are included in Alterna.

We can also determine that the mains arguments in the Alterna communication are firstly its green energy source but also dozens of small electricity suppliers, which create a feeling of closeness at the regional, level with the consummers.

3. Analysis of competitor's offer

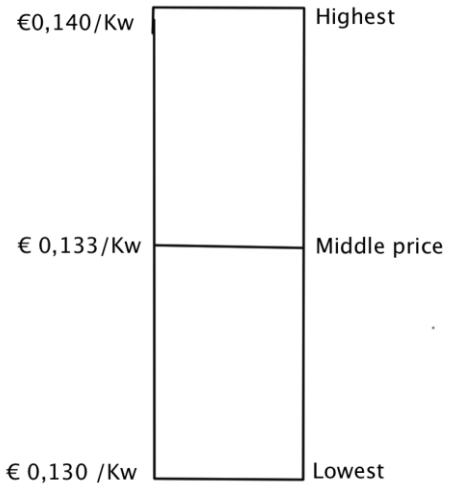
Offers	EDF Blue offer	GDF E-dolce	Direct Offer
Subscription	€705	€693,80	€705,51
Price per Kw	€0,115	€0,120	€0,105
% Of renewable energies	9%	0%	20%

In conclusion, the commercials offers of "traditional" electricity suppliers are homogeneous. The average price per Kw for selected companies is € 0.112 / Kw. The price gap between the highest offer of € 0.120 / kW (GDF Suez) and the lowest offer € 0.105 (Direct Energy) is only € 0.015. The energetic mix of the three companies are also almost identical with large predominance in nuclear for EDF and Direct Energie, GDF Suez stands out with a diversified energy mix where the nuclear share is only 5%.

Offers	Enercoop	Yes Energy	Alterna
Subscription	€1000,95	€705,51	€696,88
Price per kW	€0,140	€0,133	€0,130
% Of renewable	100%	100%	100%

The offer's disparity of green energy suppliers is high compared to traditional suppliers. The Enercoop's annual subscription (the most expensive) is € 1000.95 and the Alterna (cheapest) is € 696.88; which equals to a price difference of 43% between the cheapest and the most expensive offers. Concerning the price per Kw, the gap between the most expensive and the cheapest offer is still important equivalent to 7.69%. The most advantageous offer in terms of price of green electricity is still 23% more expensive than the cheapest non-renewable offer. The average price per Kw in green suppliers is about €0.134/Kw. Finally in term of price per Kw, Green electricity providers are 20% more

expensive than “Traditional providers” and 10% more expensive in terms of annual subscription. The competitor’s price study will therefore allow us to determine a price range in which our future business may decide to implement and by this way, determine its pricing policy.



4. Competitor’s Marketing Strategy

Supplier	Strategy
GDF Suez	Safety and expertise.
EDF	Mainly: oriented on quantity and quality of services and customer relationship, and secondly on reliability and security of the supplier.
Direct Energie	Price focused and Direct Energie also tries to be positioned on renewable energy.
Planet Yes	Green energy, and Prices.
Enercoop	Green Energy and only it, whatever the price. The company as its strategy is engaged in ecology and environment.
Alterna	Union of several small producers around

	a single brand.

5. B2B services offer by competitor's

Suppliers	Free Services	Paid Services	Online Services (In the website, online customer area or smartphone app)
GDF Suez	Field technicians, Customer service (phone call	Energetic opimization, Advices in sustainable development (rehabiliation, creation), Dedicated teleconsultant who will remain the same	Consumption's historical, Online meter reading, Automatic Invoice debit, E-Invoicing, Cap Ecoconso (compare consumption to previous years or other clients consumption), Smartphone app, Online invoice simulation
EDF	Field technicians, Customer service (phone call)	Installing heating and insulation (partners), Energetic advices for construction (regula-tions, materials), Eco-gestures formation, Energetic renovations financing (partners), Energetic diagnosis,	Automatic Invoice debit, E-Invoicing, Online meter reading, Monitoring consumption, Online chat with counselor, Online claim, Smartphone

			app (all online services available on the app), Online invoice simulation
Direct Energie	Field technicians (Subcontractors), Customer service (phone call)	Technical Assistance 24/24 – 7/7 (4,99€/months	Online meter reading, E-Invoicing, Online chat with counselor, Smartphone App, Online Invoice simulation
Planète Yes	Field technicians (Subcontractors), Customer service (phone call)	Paper Invoice (1,25€/months)	Online chat with counselor, Services to reduce the invoice by 20% (“électréconso” and “Électrécolo”), Online contract modification, Consumption’s historical, E-invoicing, Compare consumption to previous years or other clients consumption, Online meter reading (10% reduction if the customer do the

			online meter reading each months)
Enercoop	Field technicians, Customer service (phone call)		Online Agency (couldn't see what's inside if your not customer), Invoice estimation, E-invoice
Alterna	No infos about Field Technicians, Customer service (phone call)	Energetic advices for rehabilitations	None

6. Competitor's communication strategy

Suppliers	Communication's message or Role played trough communication
GDF Suez	Trusted advisor (paternalistic)
EDF	Brand image and quality of services oriented
Direct Energie	Low Cost and ease of use
Planet Yes	Price, services and ecology (green energy can be cheap)
Enercoop	Ecology and civic action
Alterna	Regional branding and ecology

a) Competitor's webistes approach

Supplier	Corporat	Commercial	B2C online	B2B online	Commercial	Commercials

	e Website	Website	subscription	subscription	sArguments for B2C	Arguments for B2B
GDF Suez	Yes	One for each targets	Yes	No	Price promotions, Additionals Services	Few things highlighted (personalized services as appointed interlocutors in customer service)
EDF	Yes	Both B2C and B2B	Yes	No	Services innovation (smartphone app), explanation of all services proposed by EDF, low carbon emissions	
Direct Energie	No	Both B2C and B2B	Yes	No	Price (low cost), ease of use	
Planète Yes	No	Both B2C and B2B	Yes	Yes (conditions)	Green energy, renewable energies, offers to decrease invoice	
Enercoop	No	Both B2C and B2B	No	No	Green energy, renewable energies, famous partners, civic action	
Alterna	No	Both B2C and B2B	No	No	Small structure, local producers	

7. Positioning Diagram

Thanks to informations compiled from several competitors, we could determine the positioning of these companies on the French Electricity Market. And later find the better positioning for our proper company regarding the current positioning of competitors.

We can see thanks to this diagram positioning that Enercoop is oriented towards the product, that is to say that his strategy revolves around green electricity that the company

supplies and not the services (which are basics) in addition the company is positioned as the most expensive. Planet Yes is between the service-oriented and product-oriented, indeed the product (green electricity) positioning is highlighted in either communication or marketing, but the company also positioned itself as a service provider with services as those to decrease the invoice, despite these promotions yes planet is still positioned on a high price because. Its offers are still expensive compared to other competitors. Alterna is product oriented because it offers few services and base its communication on its green features (that is to say its core product). For non- green suppliers are all positioned on low prices, it is event the heart strategy of Direct Energy (low cost supplier), EDF is positioned on the many services that the company offers. GDF Suez tries also to follow EDF in its strategy because both companies have the same brand image and monopoly experience on the market.

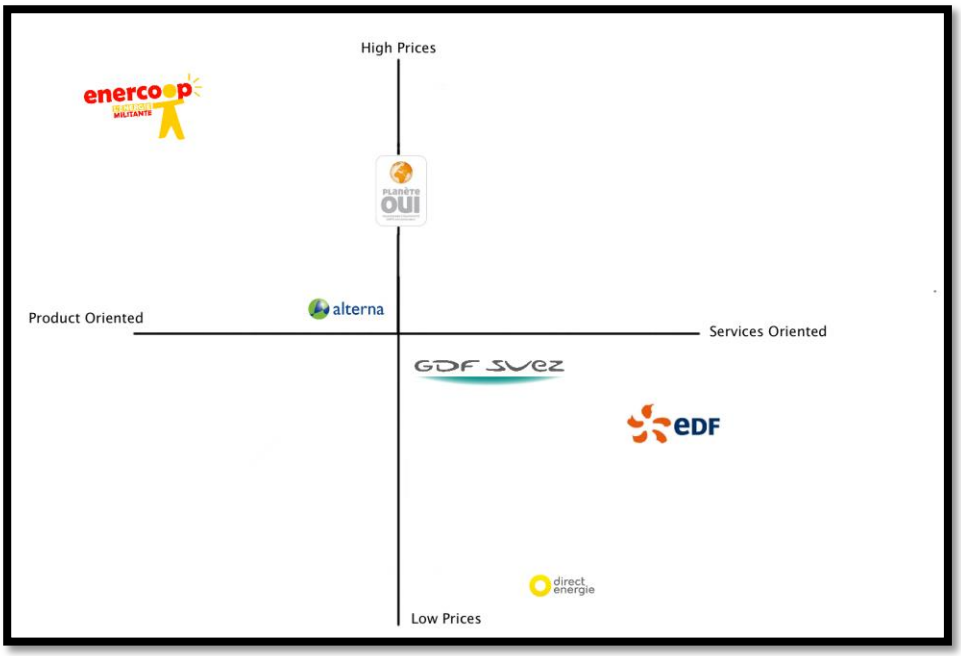


Image 22: Market Positioning Diagram

8. Conclusions on competitors analysis

In this section we have seen that the strategies employed are very different between the companies providing green electricity that are really focused on their gross product and the ecology and traditional providers which are focus more on the quality of service. Moreover thanks to the analysis of websites and services we have determined that more or less only some companies like EDF really offers a different and innovative offer in terms of services, other companies offer basically the same services. In terms of communication each are

specialized and communicate about its strengths EDF and GDF Suez enjoy their great brand image which does not seem to tarnir over the years, finally we can see that the market is quite unbalanced indeed small providers like Direct Energy or Enercoop have difficulty competing with giants EDF and GDF Suez which have budgets of marketing and communication 10 or 100 times larger. These small companies have then chosen specialization in ecology to counter giants because EDF can not do because it because of its specialization in nuclear energy.

In conclusion this part has allowed us to determine the strategies of the main competitors on the market and prepare an inventory of the current competition. Now we can thanks to the information collected at the time in market research, customer study and study competitors, create our own Marketing Plan inspired both by the expectations of potential clients, strategies already in place on the market and the state of this market.

1. Overall Presentation

We offer energy from a wind and wave farm, located in the Danish coast.

The farm consists of 8 turbines and 6 buoys and it is 5 km far from the coast. The wave and wind farm has the capacity to produce 77525 Mwh.

The energy will be 100% green energy from our farm and we are offering that energy to different companies that want to consume electricity from renewable sources.

A farm like this, with wind turbines and wave buoys needs to be in a place with enough wind and wave power, the place that we have chosen meets that needs.

SWOT

Chart 28 SWOT

Strengths	• Wave and wind energy are unlimited resources, therefore we will always be able to exploit them which is a big strength due to fossil fuels that are a cheaper electricity solution will be unavailable in a few years. • We offer energy from an almost new technology that can attract investors and customers for its newness.
Weaknesses	There are four main weaknesses in the wave and wind energy farm: • Uncertainty in the production, it is very difficult to make a good estimation of the output of a farm like this due to the difficulty of forecasting winds and waves and besides wind is intermittent. These sources don't produce more when it is necessary like a nuclear plant, they produce when the speed

	of wind and waves is adequate. • Impossibility of storing the energy produced, this weakness is in relation with the uncertainty of production due to if the output wasn't intermittent, storing won't be needed; but as it produces only when the weather conditions are met, sometimes the production is higher than the demand. • Profitability, a big investment is needed to install a farm, and some farms aren't profitable yet. There are some government aids like the obligation of purchasing the energy to assure revenues but still be difficult to make profit with the high cost of the installation • New technology, this could be a strength or a weakness, being a new technology increases the risk of the investment, the only information and figures that we could use are estimations but not proofs • Competitors established in the market for many years
Opportunities	• Increase of the demand and the industry, more companies demanding green energy and also individuals or households • Subsidiaries increasing that makes companies benefit from using green energy • Technology improvement that allow us to produce more or reduce costs.
Threats	• Subsidiaries reduction, subsidiaries could benefit or not, in this case, if there's a reduction, the demand will probably decrease. • Law restrictions

1.1. Benefits

The use of our energy will benefit the customer in different ways:

- Improve brand awareness: Eco friendly and a 'moving towards the future' appearance
- Good service: efficient customer service, actualized website with all the data and information in addition to other services
- Easy to purchase and find the best option for your company
- Get state subsidies for using clean energy

1.2. Stage of Development

We are in an early stage of development; there are only a few farms like still not selling energy and ours.

A growing of this resource is forecasted to be in the next years due to strict EU ecological policies so it is supposed to grow fast and be possible to consider this source as reliable in a few years.

2. Marketing Plan

2.1. Target Market Strategy

Market segmentation:

We will focus on the business-to-business market because businesses have some benefits if they use green energy, and therefore are willing to pay a higher price for the electricity than individuals (we sell high-price electricity).

Concerning demographics, our company's target customers are small to mid-size companies (0-500 employees) from the three sectors (primary, secondary and tertiary) that are located in France.

Analyzing psychographic criteria with the interviews, we found out that our target companies are organizations which motivations to consume green energy are: improve brand image, ecological responsibility or receive state subsidiaries.

Regarding the companies surveyed reasons for high satisfactions; we have discovered that he most common reasons are efficiency, reliability or green energy that are some of our main values and also, the second reason of low satisfaction is inefficient customer service where we could win customers due to our customer service will be working good.

In relation with the buying decisions, in the 54% of the companies interviewed the director will make the decision to change supplier, followed by the board or accounting service with more influence on the decision making of large businesses.

Considering these facts, we will divide our customers into three different segments:

- Primary sector companies working on organic agriculture or agro-alimentary with an average size of 18 employees and with an environmental policy. Located in the Midi Pyrenees. These companies are willing to pay a higher price in order to consume green electricity and their brakes to change supplier are often lack of information or reliability that could be fixed with marketing and communication.

- Secondary and tertiary companies with an environmental policy. These companies are willing to pay a 22% more to consume clean energy. For the moment we won't focus in this target group but that group could be our next step.

At first we will focus on the first target group due to is the one who best fits in our company characteristics and values; but our goal is to expand our customer target in order to find other sectors like our first target group and supply companies from all the economic sectors.

2.2. Channels

Choosing the appropriated channel to reach our potential customers is important in order to transmit our values to our potential customers and to success. Due to our

potential customers are small-to-large companies from different sectors and also from different regions, we will use a multichannel marketing strategy.

Considering the market and our target groups we have decided that the channels that will better fit our needs are a company web page, four commercial agents (one for each region), a telephone customer service, EPEX SPOT stock and the governmental electricity webpage.

Regarding the interviews, we found out the ways the different companies prefer to find or receive information.

- Primary sector companies, that usually are small, the way they would look for information is the internet followed by independent consultant and office provider
- Secondary sector companies prefer independent consultant followed by commercial service or Internet.
- Tertiary sector companies prefer the Internet, independent consultant, provider office or customer service.
-

Primary		Secondary		Tertiary	
Internet	60%	**Independent Consultant**	67%	**Internet**	67%
Independent Consultant	30%	**Commercial Service**	11%	**Independent Consultant**	14%
Provider Office	10%	**Internet**	11%	**Provider Officer**	11%
		Provider Office	11%	**Customer Service**	8%

Chart 29 Preferences in receiving information

Like our competitors we will develop a webpage with all the information about the origin of our electricity, benefits, the price, special offers and all the information regarding the company. In the interviews we have done, we found out that many of the

companies would choose internet to look for a new supplier so in our opinion, a good website could help us to attract new customers. Besides, we will appear on the government webpage 'Energie info' that is a comparator of all the prices and services and redirects you to the company webpage that you choose to purchase or look for more information; that will be a partner channel that will give us credibility due to it is a government webpage and also, make us known by al lot of potential customers.

Concerning the commercial agent, it allow us to talk face to face with potential customers, inform them about our product and service and win other bigger electric companies.

We will hire four commercial agents, dividing the country into four regions (South West, South East, North East and North West). These agents should be people with a deep knowledge of renewable energies, subsidiaries and green energy benefits and also, with special selling skills.

It will be possible to request the visit of one of our agents in order to receive information or purchase. By the way, our agents will be visiting companies every day to try to make new customers. After choosing our four agents they will have to go through a special course about our company and the market. Concerning the salary, a variable salary will increase their motivation to make new customers.

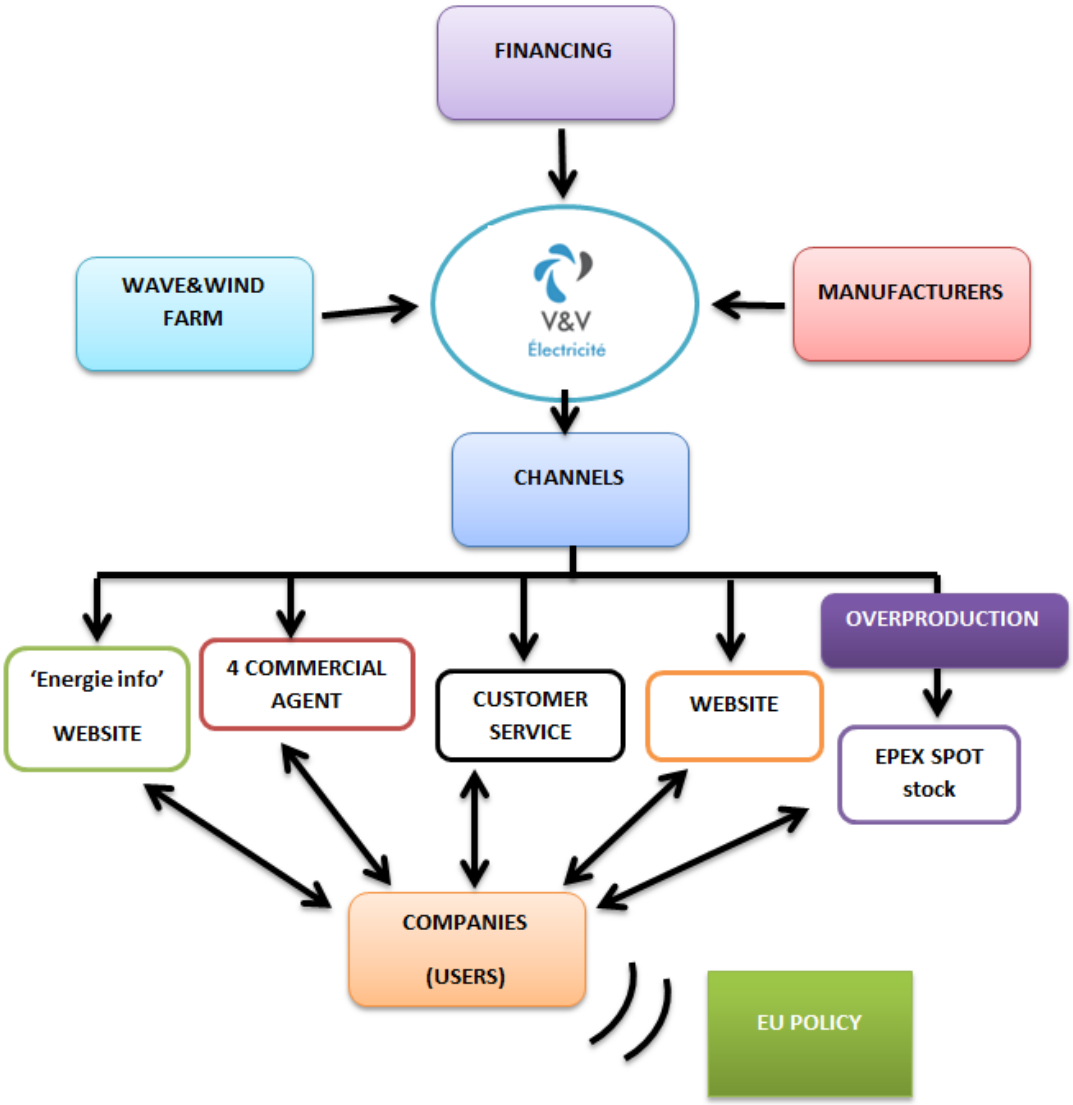
Regarding the telephone customer service, it is important to have a platform where customers could call and talk directly with somebody from the company in order to solve his doubts, purchase or solve any problem. A good customer service will build loyalty and win customers confidence.

In relation to the EPEX SPOT stock, we will sell there the overproduction due to at first it's difficult to have enough customers to meet our total production but we expect to have all our production demanded by the time.

We will use our channels and partners channels, using a multichannel strategy due to nowadays customers usually do the purchase process through different channels; customers usually seek on the Internet for information but when the time to pur-

chase comes they may prefer to call the customer service or purchase through a commercial agent.

Chart 30 Company



2.3. Positioning

Our company name is 'Vagues&Vent' (V&V) which means 'Waves&Wind' because our energy comes from wind and wave resources. It is an easy way to show that we offer renewable energy.

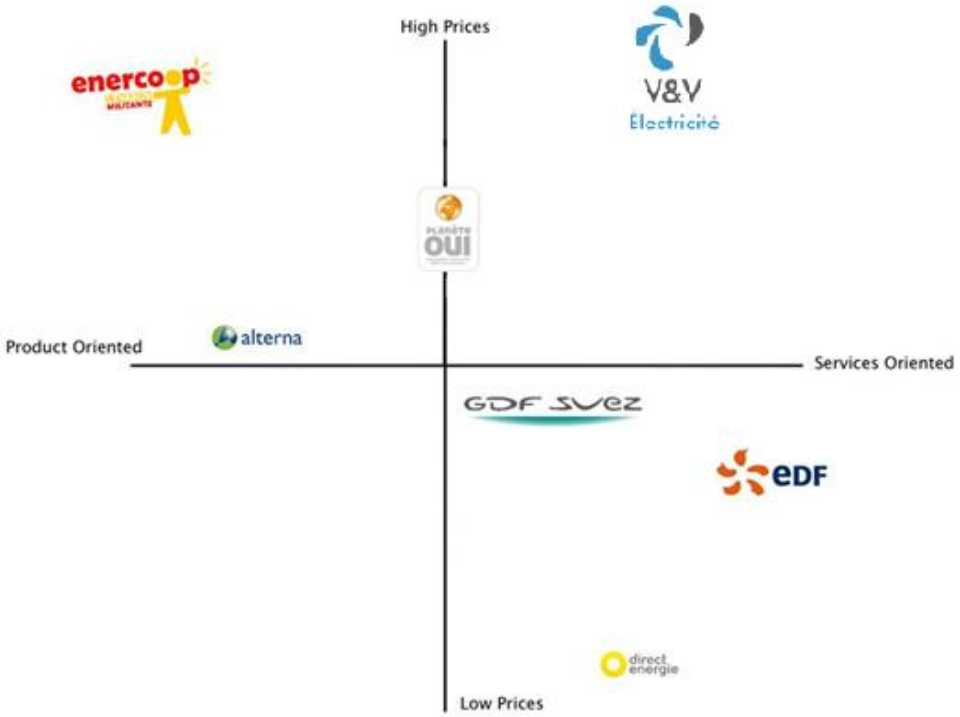
Picture 3 Company logo

Concerning the position where we want to place our company in the market we have to take into account some factors:

- We are an electricity company that offers 100% electricity from renewables, therefore we have our niche of the market. Companies that choose our service will show their customers that they are ecofriendly and that have environmental awareness
- We have high price due to our production cost is higher and also, consumers are willing to pay a bit more for green energy
- We are more product oriented rather than product oriented because we will focus our strategy in offering a better service than our green energy competitors 'enercoop' or 'Planéte oui'. We have chosen the services as the thing that could differentiate from our competitors; we have high price as 'enercoop' and we also have good services as 'EDF'.

For all these reasons we are going to position V&V Électricité as a green energy supplier with high prices and service oriented.

Chart 31 Positioning



Potential customers will be interested in us for being a green energy supplier and will choose us rather than our competitors for our additional services.

3. Product and Services

3.1. Basis Product

Our basic product is 100% electricity from renewable sources and has no impact on the environment. The benefit of this offer is that it allows users to have the choice of the origin of their electricity, to reduce their impact on the environment.

3.1.1. Associated Services

Free Services	Online Services

Field technicians, Customer service (phone call)	Consumption's historical, Online meter reading (the customer send trough the website his monthly electric consumption, Automatic Invoice debit, Smartphone app, E-invoicing, Customer account (have access to all the online services on the same page), Online chats with a tele-counselor.

Chart 32 Services

Associated services are the services included in the contract between the customer and the electricity supplier. To determine which services offered to our future customers we used the study of competitor services. The associated services allow providing support to users; this is the case of technicians of land in case of problems with installation or customer service for any request relating to the electricity contract. Moreover, some services are available to make the life easier for the user and facilitate interraction between the customer and the company. The users have access within few clicks on their computer or smartphone to a lot of information or functionalities thanks to the online customer account. Although green electricity has already a different profile than traditionals suppliers, in the context of competitive market related services are very important because they add value to the product.

3.1.2. **Additional Services**

Chart 33 Additional services

Services	Explanation	Price
Eco-environmental formation	Steps and strategy of an environmental project in business The eco-friendly shopping	1250€ / employees

	the dematerialization of internal communication Eco-consumption	
Energetic diagnosis: "Performance and Energy Management"	Diagnosis Develop an assessment of the overall energy situation of the company, to quantify the potential energy savings, positive and negative points, define actions to make energy savings and implement a sustainable energy strategy. Support the choice of service provider The company following the diagnosis and recommendations made, may assist the company in its choice of service providers to implement the actions.	According to the (Chamber of Commerce and Industry of Bordeaux 2012), 800€ / day for an average duration of 10 weeks, so the equivalent of 40,000€, funded 50% by the French state.
Assistance in obtaining the European EMAS (Eco Management and Audit Scheme) standard	According to Wikipedia, the EMAS is a environmental certification, which allows any business or organization wanting to assess, improve and report on its environmental performance in an environmental management system	According to the Chamber of Commerce and Industry of Paris, between 6000 and 9000€.

	recognized, standardized and credible.	
Ecologic Communication Plan	Our company proposes to include an environmental component in the communication of the client company. Indeed, consume green electricity is a great image's vector and it is important to include it in the communication to have comercial or branding benefits.	Personalized

The additional services are a part of our both assimilation and differentiation strategy (explained in the part positioning of the marketing plan), in fact thanks to these additional services, the company can provide more than a supply of electricity, but services that are closer. This is the case of the environmental consulting business that we would try to develop, because we believe that this is a path unexplored by other green competitors while these consulting activities are widespread in EDF and GDF Suez offers. In addition, our target is companies with Environmental policy and Energy consulting services that we'll offer (Eco-environmental training, Energetic diagnosis: "Performance and Energy Management", Assistance in Obtaining the European EMAS (Eco Management and Audit Scheme) standard and Ecologic Communication Plan), are in perfect harmony with the possible expectations of these companies in terms of energy and ecology. Additional services then allow to bring a value added to the product but also to differentiate the offer from competitors by making it more diverse.

3.2. Development Strategy

3.2.1. Short Terms

5-year plan to achieve the company's goal of 5074 customers, allowing the company to achieve its "cruising speed" and have no overproduction; indeed, after 5 years the supply of electricity (77Gwh) will meet customer demand (77Gwh), allowing the company to sell its entire electricity and consider a new investment campaign to attract new customers.

3.2.2. Middle terms, between 5 and 10 years

Passed the 5 years cap, according to our forecasts, the company will join the offer and demand, its sales will not increase anymore. It will be time to invest in new production capacity to increase its green electricity offer, to reach customer and raise the turnover. However, the investment in renewable energy production is very expensive and the company will then has to raise capital from investors. In addition, if the company increases its productive capacity then it must attract new customers. To do so, we decided after the 5th year to expand our target to all French companies wich have Environmental strategy, in fact we've seen thanks to the questionnaire that companies without Environmental strategy were not interested and by green energy given its important price. To not to waste time and money we decided to stay focus on this market segment namely companies from the three sectors with an Environmental policy.

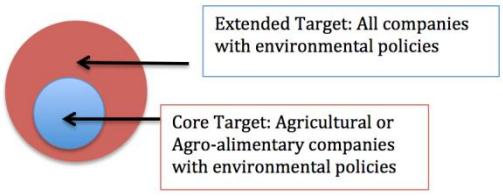


Chart 34 Target groups

3.2.3. **Long terms, at least 10 years**

Internationalization processes are carried out for the companies with the purpose of growing. Once the business is settled in its geographical market, some other goals

must be taken in order to keep on growing, and going overseas and develop new markets may be a good idea for the company.

Before taking the decision of expands, the company must think about if it´s ready to do it (enough resources).

We have in mind to take expansion operations in forecast years, after developing our service and settled in France. The main idea of the company is to spread in more and more European areas starting with such countries as Nordic Countries because they are very open to renewable energies and also Germany because the country after the Fukushima case planned to take the nuclear energy off from its energetic mix and so the part of renewable will be higher.

3.3. Pricing Strategy

Setting the right price is one of the most important issues that affects directly in the success of the company.

The pricing strategy that we will follow is a value-based strategy; we offer green energy so customers are willing to pay more so we set the price accounting the benefits of using our services.

In order to set the right price, we have to take into account some factors:

- Fixed and variable costs: to know the cost is important to set the price due to if we set a price below the cost we will be losing money.
- Competition, there is a big competition among companies of this sector, our main competitors that are green energy suppliers have a price of 0.13€/kWh and 0,14€/kwh and other electricity solutions are cheaper but don't offer clean energy.
- Positioning strategy: as it is written in the positioning part, we will position our product as the most expensive of the market at the same level that 'enercoop' because these company offers something similar to us, and we can't decrease our price due to our high cost and because our customers are willing to pay a high for our eco-

friendly electricity. Our main objective is to compete with green energy suppliers, not with normal suppliers because it is so difficult to compete against them due to their low prices and background in the market.

- Target group: our main target group is willing to accept a high price for the electricity as we can see in the survey, so the target group fits in our pricing strategy.
- Value of the service: we have to take into account the value of our product in order to estimate how much people will accept to pay. In this case, from the competitors analysis we know green energy is expensive and that the additional services that we will offer worth a high price

Our price is 30% higher than historical supplier but according to our survey, our main target group could accept a 23% increasing of the actual price and the other companies surveyed will accept a 12-11% of increasing.

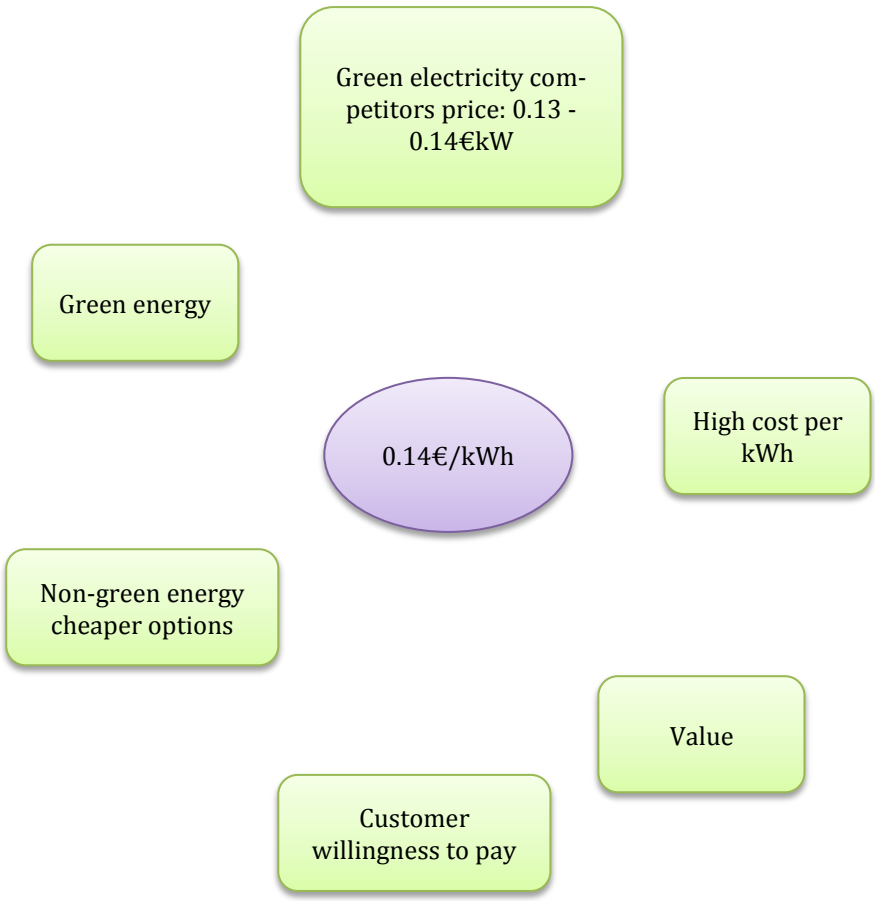
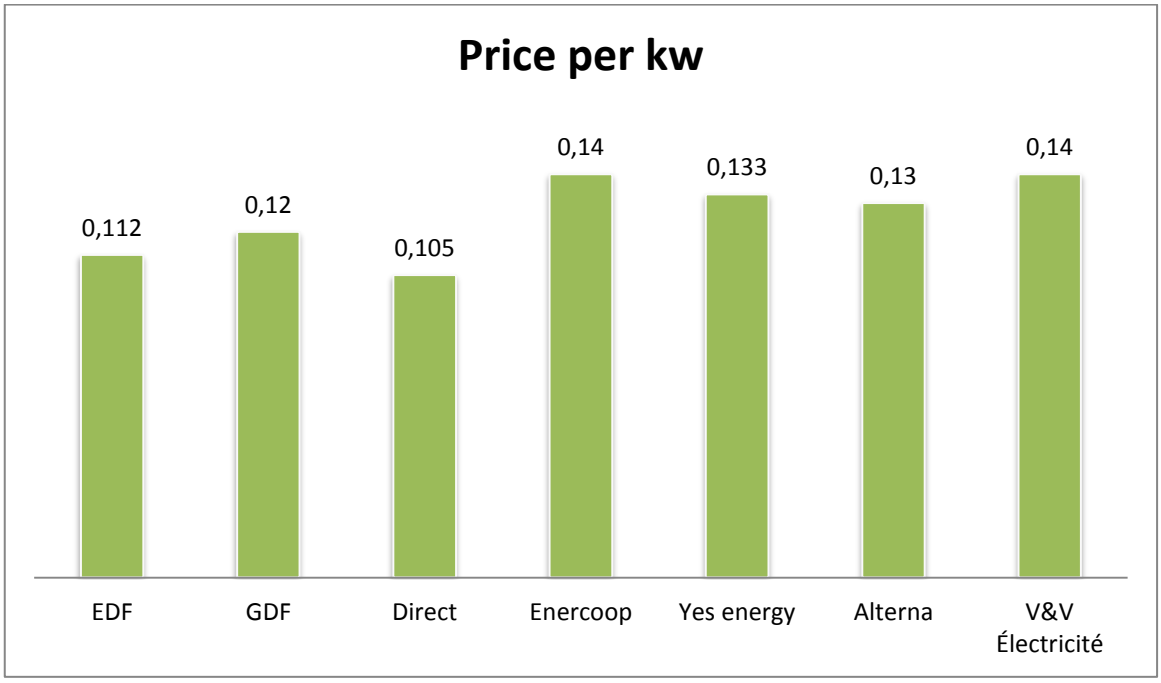


Chart 35 Price

Our price compared to competitors price:

Chart 36 Price per kw



This is the prices list:

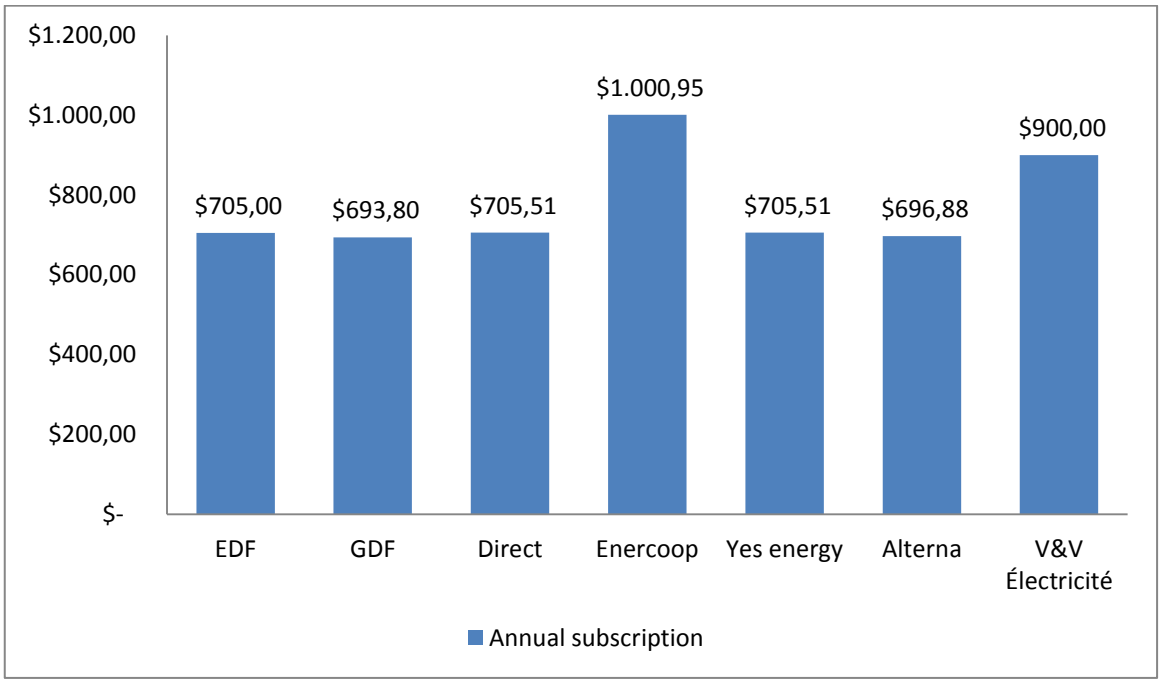
Chart 37 Prices list

SERVICE	PRICE
Eco-environmental formation	1.250€/ employee
MWh	0.140€
Energetic diagnosis	40.000€
Assistance EMAS	8.000€
Ecologic communication	Customized

plan	
Annual subscription	900€

Have positioned the annual subscription considering competitors' prices, we will have a price lower that 'eneercoop' and higher than the other competitors. The annual subscription is the price the customer pays for the maintenance fees of the electricity network.

Chart 38 Annual subscription price



3.4. E-commerce

We are going to develop a website where everybody can find all the information about our company, services and purchasing.

All our competitors have a website but not all of them offer the possibility to purchase through their website, so we think that it will be important for us to be possible

to purchase in our website to ease and speed the buying process. It will be possible to purchase B2B that is an option not available in the competitor's website.

A section of the website will explain all the corporate information, our wave and wind farm and our commitment with the environment.

In our opinion it's important to develop an intuitive website where it is easy to find what customers want and with clear information.

We will offer some online services such as:

- Consumption historical where the customers can consult their year consumption, the maximum or the minimum as well as other data.
- Online meter reading where the customer can send his monthly electric consumption.
- E-invoicing
- Customer account to be able to use all the online services
- Online chats with a counselor to solve customer's doubts

We will also have a monthly email subscription that will inform the customers about the special offers, new services and some information about their consumption and ways to reduce it.

A smartphone app will also be developed, where customers could access with their personal account and check their consumption or contact the customer service.

The company will appear in the state website 'Energie info' where all the information about electric companies is showed and where there's a comparator between different companies. This website redirects customers to the company website they choose in order to consult or purchase. To appear in this website is very important for us because it's an objective website with a lot of visitors willing to change their electricity supplier.

Our website will offer customer and technical support though online chats with a counselor or technician where all the customer's doubts will be solved. There will also

be a service for non-customers that are looking for information or measuring up to change supplier.

3.5. Communication and sales strategy

We are going to use the communication plan as the way to reach customers and therefore to reach our sales objectives.

3.5.1. Why a Communication Plan?

Making a communication plan will allow us to set the communication actions we have to do to establish the communication strategy of the company using the objectives, target groups, channels, and the company image. We will base our communication plan in the survey we did to French companies and the data we acquired on it in order to set the right steps we have to perform achieve our sales objectives.

3.5.2. General Introduction of the Communication and Sales strategy

We are going to use the general method “What, Why, Who, How much, How, When” for our communication and sales strategy. Using this method will allow us to create a clear communication and sales plan easy to read and to understand our main objectives and actions.

This part is a general overview of the plan and later we’ll go into more detail of each strategy.

3.5.2.1. What

This communication plan objective is to promote our company and the services it offers. We have to take into account that we are a new company so our main objective now is to make us known for as much potential customers as we can through our channels and inform them of our characteristics and value. After the first approach to

potential customers and winning some customers, we will move our strategy into one based on customer loyalty.

Regarding the objective of the sales strategy we have to consider our needs and potential, we have set these sales objectives:

- ✓ 5074 new customers within 48 months
- ✓ 106 new customers per month within 48 months
- ✓ Eco-formation of 150 employees / year
- ✓ Energetic analysis: 5/ year
- ✓ Obtaining the EMAS
- ✓ Communicant plan service: 20% of the Services turnover

3.5.2.2. Why

We have three main communication objectives:

- Create brand awareness; in other words, inform our target group about our existence.
- Persuade our target groups to use our service showing them our values and how they will benefit from signing on with us. For this we will also have to differentiate us from our competitors because we are a new brand.
- Make companies be part of our communication plan if they recommend us to other companies.

The main sales objective is to sell as much as we can in order to make profit. The bigger number of people we reach with our communication plan, the bigger amount of sales we will have.

3.5.2.3. Who

Small-to-large companies working on the organic agriculture or agro-alimentary sector with an average size of 18 employees and environmental policy.

We have to consider the decision-making of the different sizes of companies in order to deliver the right message to the right person:

- Directors: according to the results of our survey, in the 54% of the companies interviewed, the one who will make the decision of changing to a green electricity supplier will be the director; this mainly happens in small companies.

- Board and accounting service: in the 42% of the companies the board or the accounting service will be the ones who make the decision, this happens in large businesses.

Directors

They rule the companies therefore they don't have much time to attend long phone calls or search for information on the internet unless it is a very important decision. They usually don't look for information on the internet but they receive the information and prefer to speak face to face with somebody in order to make a decision and be informed about all the aspects regarding the purchasing. If we try to reach them by phone calls the one who picks up the phone will be the secretary and will probably tell us that the director is busy or she will receive the information and finally the director will receive a modified message or just a summary of the information that won't motivate him. For all this reasons in our opinion the best way to reach directors is by our commercial agents that could arrange a meeting with the director and have the time to explain them about the company and the services we offer. Reaching directors is also important for us because they usually have connections with other directors and if they like our service they will probably tell them their experience and encourage them for measuring up to change the electricity supplier. Besides, they will be involved in the decision as it will benefit their company and will have an impact on the turnover and also, they could be more passionate on fulfill the needs of the company regarding ecological issues or brand image.

Board and accounting service:

They don't rule the company but are often involved in the decision-making as the companies interviewed told us, and usually have more time to make the decisions than the director. This happens mainly in large companies where the director only makes the biggest decisions. The boars and the accounting service usually search

on the internet for information and services that could benefit the company and also often receive phone calls and commercial agents visit's. That is why the way that we are going to use to reach that kind of companies is through the internet, making phone calls and also with our commercial agents. They will be less passionate on the decision-making but more objectives on the benefits of the change; moreover they will probably compare and measure up all the suppliers' offers.

How much:

Our budget for the sales strategy includes:

- Salary of our four commercial agents: 30% commission
- Phone calls:
  - 440€ cost of calling the companies
- Webpage with a cost of 3000€/month

So we can say that our annual sales budget will be 383.564,92€ per year

How

We want to use a communication strategy called "brand communication" that consists in the creation of a universe around the company, build a brand image highlighting our eco-friendly mind and that every company that uses our services shows their customers that cares about the environment; and involve them in the ecological flow. With this strategy we want to become a reference in the energy market concerning ecological issues.

When

Our company is expected to start selling energy in 2015 so our operations will start before that time to start the promotion and then we will follow a schedule that will be presented later.

Strategic challenge:

"Look, compare and decide to change your energy supplier in order to improve your contract conditions and preserve the environment"

Communication objectives

Our communication objectives are to create brand awareness , transmit our values and involve companies in the marketing strategy if they recommend us to other companies.

Message

- **For directors**

✓ V&V Électricité is a company with a strong environmental commitment, young and innovative

✓ Your company will give the image of an ecological and innovative company, ecological because it will use green energy and innovative because the energy comes from a new-technology farm

✓ We will study your consumption and give you the best option for your company, we care about your company

✓ Highlight the special services we have, such as smartphone app, historical consumption…

- **For boards and accounting services**

✓ Explain amply our wide range of services due to boards and accounting services are more objective and how they will benefit from them.

✓ Inform about the possibility to take state subsidiaries

✓ Show them that if they choose us that will benefit them to build brand image and to get special certificates

3.5.3. Communication and sales activities

We will cover all the communication and sales actions due to we expect to start winning customers fast. Those actions involve:

- Visiting potential customers
- Calling companies from our target group
- E-commerce

In order to achieve our sales objectives we have to do some actions to make it possible:

We will hire specialized employees that allow us to implement our action plan.

- **Visiting potential customers**

We will arrange meetings with directors, boards and with the accounting service of many companies in order to persuade them to sign on with us. This is a slow process but effective and we can choose exactly the message we want to transmit and solve all the doubts concerning reliability or lack of information.

The commercial agents will also visit companies without having arranged a meeting previously. Talking directly with companies will also help us to increase our market knowledge and maybe modify our strategy in order to win more customers or to implement new services.

The objective is to reach our target group companies through an effective and a bit expensive way. The commercial agents will earn a 30% of the contracts they make.

- **Calling companies from our target group**

We will make several commercial phone calls expecting to success in the 5% of them. We know companies receive many phone calls every day but we believe we can transmit them the right message to motivate them to choose our electricity.

We won't call directors but boards and accounting services of companies from our main target group. This is a cheaper way of reaching potential customers and can cover many regions and companies.

- E-commerce

We will promote our website through two channels:

- Our own website: as we explain in other parts, each customer will have an account in order to consult their own figures and use all the services. For potential customers that visit a website there will be our section with all the company information regarding corporate image, brand and values. Besides, there will be a section where companies will be able to sign on easily. Another service that we will have will be an online chat where companies can contact us directly.

- State website "Energie info": it's a website that gathers all the electricity information and acts also as a comparator of all electricity suppliers. Besides, if you decide to purchase or to look for more information, it redirects you to the company website.

We have decided not to make a physical commercial brochure due to our environmental commitment so we will make a complete online brochure that presents our company.

➢ Newspapers and television

We found out in the interviews that Internet, business fellows and newspapers and television are the ways companies receive energy information.

Concerning newspapers and televisions we will advertise our company with small advertisings due to television advertising is very expensive.

We will focus more on newspapers, as it's cheaper that television and 12% of the companies interviewed received the green energy companies' information from newspapers.

As we said before, we will use Internet as a channel to communicate to potential customers and also through satisfied directors of companies that use our services.

This will concern the communication strategy and will consist in advertising

3.5.4. Planning of the actions

This is the schedule that the action plan will follow; the actions are for the first year:

- Visits of our commercial agents will start the 2nd of January and continue every weekday all the year.
- Calls will start the same day as visits and also continue all the year.
- Our website will be working before the start of purchasing just as an informative website and to start creating brand awareness.
- We will appear on the state website as soon as we start selling energy on the 2015.

3.5.5. Budget

The sales strategy is going to cost us 383.564,92€ per year, it is a high amount but the most expensive costs are variables depending on the number of subscriptions and also, is the necessary amount to achieve our sales goals. The budget is divided into the three different actions:

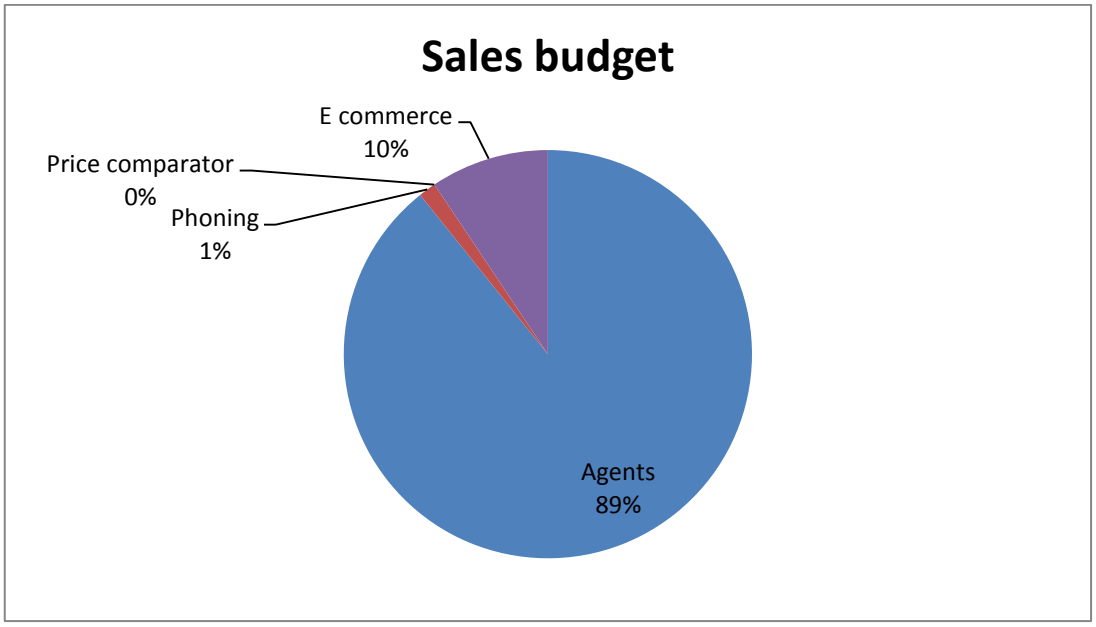


Chart 39 sales budgets

- Commercial agents 342.284,92€ (30% of commission)
- Phone calls 5.280€
- E-commerce 36.000€

To sell our electricity we will focus our strategy in highlight its benefits for being a green energy and our additional services rather that in the price, we have high price but customers accept it because of the characteristics of our energy.

III. Financial Data and Forecast

As explained in the project description, the purpose of this part is not to create a complete financial analysis and forecast, but created a financial section that can explain and argue the sales and communication strategy, and argue about the customer objective of the sales strategy for instance. The figures presented here, have been rounded to avoid presenting data with many decimal places; you can find the financial tables with the exact values in the appendix.

A. Consumption and Target Size Forecasting

Foremost, to be able to achieve our assumptions in terms of turnover, profit or charges. We had to determined two key points:

- The size of our target, according to (French Institute for Economical and Social Studies 2012), in France there is 515,000 businesses in the agricultural and agri-food sector in 2012.
- The average annual energy consumption, according to (Ministry of agriculture, agri-food and forest 2012) in its report about the "Energetic Consumption of Primary Sector Companies", the average electricity consumption for agricultural and agro-food business was about 0.69 million "Ton of Oil Equivalent" in 2012. The International Energy Agency estimates that one "Ton of Oil Equivalent" equals to 11.63 MWh. We can therefore estimate that the average consumption of French companies in the sector is 15.58 MWh per year (Sector's consumption in millions of ton oil equivalent (0.69) * Equivalent of 1 million of "Ton Oil Equivalent" in GWh (11630Gwh) = 8024, 7 GWh / year (8,024.7 / 515000 (number of firms in the sector)) = 0.01558 Gwh or 15.58 MWh.

Number of firms	Annual Consumption of the sector
515 000	8024,7 Gwh
Average consumption of one firm / year: 15,28 Mwh	

- Another important point is to determine the number of clients to whom we can provide electricity according to their consumption and our production. Thanks to the study of Mechanicals Students, they were able to determine that our units could produce 79.05 GWh (79050 Mwh) per year, that is to say that we can provide 6587,50 Mwh of electricity per month to our clients (79050/12).

Total production	79050 Mwh
Target Consumption / year	15,58 Mwh
Target Consumption /months	1,2983 Mwh
Limit of production /month	6587,50 Mwh
Customer per month	5074

- We know now that a company from the sector consumes 1.2983 MWh (15.58 / 12). We can then determine thanks to the productive capacities calculated mechanicals students that we can provide electricity to 5074 companies from agriculture and Agri-Food, (production limit per month (6587.50) / average monthly consumption of the target (1.2983) = 5074). We were able to determine our sales objective; we must win 5074 customers to sell all our energy to customer.

B. Sales Strategy

Now that we have our sales goal we must determine the financial means to achieve its objectives, thanks to a policy of sales. We must determine several key points:

- How long for achieving the goal of 5074 customers? We expected a target of 48 months to reach our goal of 5074 customers, i.e; we must find 106 new clients per month for 4 years. This estimation is not impossible and grounded in reality, in fact according to (Le Monde 2013, Enrico Panii 2014), Enercoop a smaller electric providers in France that provides green electricity has wining 500 new customers per month since its creation in 2007.

Number of customer	% of increase according to the

		objectives
Year 1	1166	98,11%
Year 2	2438	49,52%
Year 3	3710	40,53%
Year 4	4982	4,37%
Year 5	5066	

- Which means used to win customers? According to the marketing strategy that we have made, we will use four commercial agents, a phoning campaign through a call center, e-commerce with our website and price comparison website set up by the government. Monthly objectives according to the different sales forces are:

Monthly Sales Repartition		
Commercial Agents	70%	74
Phoning	10%	11
Web Price comparator	5%	5
E commerce	15%	16
		106

- How much this strategy will cost?

– Phoning: We first defined a success rate of 5% on calls. Then we have determined the cost of the campaign, according to the newspaper Liberation in his article "Relocating call centers, a calculation to do" dated July 27, 2012, the call center charge 30 euros an hour for their phone call service, the newspaper "Journal du Net" informs us that in average, a call center make 15 calls per hour. Taking into account the 5% of successfully, call center must make 220 calls per month or 13 hours of phone call, at a cost of 440 € per month.

Phoning	
% of success	5%
Sales objective	11

number of calls	220
Price / hour	30,00 €
Number of calls / hours	15
Numer of hours needed	15
Cost /month	440,00 €

- Commercial Agents: The commercial's agents commission will be 30%, we expected them to do a turnover of € 96199,98, so their remuneration will be €28859,99 per month. We do not have to determine the number of appointments or contacts that agents must take, because they are not related to the company and they manage the way to achieve their goals as they wish, the whole thing is that they reach the goal of 74 new customers per month, since it will have 4 commercial agents, one agent should signed 19 contracts per month. The commission of 30% applies to contracts signed to provide green electricity but also for related services that the company proposes.
- E-commerce: According to Enrico Panai, a consultant in new technologies the costs of creating and maintaining an e-business website is about 3000 euros per month for a website which can host a high number of users.
- Webprice Comparator: This service provided by the french state is completely free.

	Efficiency of the Sales Strategy		
	Turnover /year	Costs /year	Earnings /year
Agents	1 154 399,76 €	346 319,93 €	808 079,83 €
Phoning	23 057,16 €	5 280,00 €	17 777,16 €
Price comparator	11 528,52 €	0€	11 528,52 €
E-commerce	35 221,92 €	36 000,00 €	(778,08) €
	1 224 207,36 €	387 599,93 €	836 607,43 €

In conclusion, the marketing strategy is cost-effective since the monthly earning is about 836 € 607.43 monthly for the company, only of E-commerce is not financially profitable but being given that the website has not only a sales function but also an information and customer service function we can say that the operating expenses of the website should be divided and therefore in this case the action of e-commerce becomes profitable.

1. The EPEX SPOT

According to The European Electricity Exchange (European Power Exchange) EPEX SPOT SE is an exchange for the trading of electricity spot for France, Germany, Austria and Switzerland. Waiting to sell our entire electricity production to our customers, we will sell the surproduction on the market EPEX SPOT. To get an estimate of revenue from the sale we took the price index of the European index of 29.05.2014, the equivalent of € 46.94. However, since quotes are changing, our estimations of sales are bound to change. The share of electricity that we sell on EPEX SPOT will decrease gradually, as our customers will increase, to no longer sell any electricity on the Epex Spot at the end of the 4th year.

	Repartition of electricity sales	
	EPEX SPOT	Customer
Year 1	89%	11%
Year 2	66%	34%
Year 3	41%	59%
Year 4	19%	81%
Year 5	0%	100%

C. Financials expectations

Once we had finished quantify our sales strategy we decided to determine if the company could generate earnings.

1. Charges

Since none of us has extensive knowledge in the areas of finance and accounting, we decided to calculate the costs of the company by benchmarking. And we noticed that the benefits of supplier

groups either very large groups such as EDF or small as Enercoop have a benefits which correspond to 2 and 5% of their turnover so they make between 2 and 5% of margins on their sales. Thus, we decided to draw inspiration from competitors and account the operating expenses of the company for 80% of sales and investment costs for 17% of sales leaving a margin of 3%.

On related services, the costs of customer research are incorporated in the compensation of commercial agents, and thanks to our propore knowledge because one of our members did an internship in a consulting company we know that in general consulting costs are around 30%, being given that it is often analyzes wich do not take into account major technical or physical means.

	Charges per years
Year 1	6 319 471,40 €
Year 2	8 472 301,83 €
Year 3	11 339 507,20 €
Year 4	14 329 679,88 €
Year 5	15 302 931,64 €

During the second year, the old and new customers have paid the annual fees of subscription. This phenomenom doubled the charges, but in return we'll see that the turnover has also increased considerably. The first annual fees were not important because the company didn't have many clients. For the other years, charges increased at the same speed than customers' augmentation and therefore revenues, expenses will stabilize in the second month of year 4 when the sales target will be achieved and the turnover won't increase no more.

2. Turnover

	Sales of electricity to customer	% of increase	Sales on EPEX Spot	% of deacrease
Year 1	1 049 400 €	+198,54%	3 220 739,28 €	-33,33%
Year 2	3 949 789,67 €	+100%	2 439 565,68 €	-50%
Year 3	6 820 612,40 €	+50%	1 525 407,30 €	-54,85%
Year 4	9 595 098,80 €	+22%	688 773,15 €	-100%

Year 5	11 052 872,13€		0 €	

Here we can see that the turnover is steadily increasing over the 5 years of operation on the sale of green electricity company. The turnover starts to by 200% and continues to grow considerably to stabilize at year fifth after reached the sales objective. Instead, sales on Epex Spot falling, as planned because it is not straegic for us to sell in this market, we do it because it is still better than nothing, but after wining our customers we don't have any interrest to seel on the Epex Spot. With our goal of 5,074 customers our turnover for the selling of green electricity will be 11 052 872.13 euros at the end of the year fifth and will not increase as the units of produtions have been reached, however, it may decrease if customers decide to switch supplier.

Sales of services	Annual Subscrip-tion	% of increase	Total turnover / year
993 000,00 €	1 049 400,00 €	+100%	6 534 778,88 €
993 000,00 €	2 194 200,00 €	+53,60%	9 278 655,35 €
993 000,00 €	3 339 000,00 €	+35,51%	12 380 119,70 €
993 000,00 €	4 483 600,00 €	+1,28%	15 462 771,95 €
993 000,00 €	4 662 000,00 €		16 409 972,13 €

Another important item of revenue is the annual subscription that customers must subscribe to have access to our electricity, subscription is 950 euros per year and must be subscribed by both existing customers as news one. Subscription in Year 5 will represent an annual flow of 4,662,000 euros.

	Total increase of the Turnover
Year 1	42.74%
Year 2	31.69%

Year 3	25,10%
Year 4	6,86%
Year 5	

3. Benefits

We can see that the company makes profits every years. The increase of earnings can be compared to the increase of turnover, indeed after an important increase (+162,42%) during first year the benefits keep increasing but in a lesser extent (+16,47%, 14,06% ans 10,36%) to get to 828 € 307.93 in year 5.

	Earnings	% of increase
Year 1	215 307,59 €	+162,42%
Year 2	565 006,78 €	+16,47%
Year 3	658 050,71 €	+14,06%
Year 4	750 530,28 €	+10,36%
Year 5	828 307,93 €	

Thanks to the financial part, we define both the average consumption of our target group and whith this data and our production combined, we wera able to define our objective in term of customer, we planned our sales strategy to achieve our goals and set up the marketing strategy that we have built, then we wuantify the cost of our sales strategy to know exactly what will the cost of gaining 5074 new clients within four years. We can therefore say that the Marketing Plan that we have built is viable; our commercial goals are achievable and cost-effective since the company will make benefits.

4. CONCLUSIONS OF THE PROJECT

Renewables have by definition the great advantage of being clean resources with low environmental impact that comes from an inexhaustible natural source. The case discussed in this project is one of them: the wave or wave energy. With the efficient running of this, foreign fossil fuel dependency would be reduced and greater energy independence.

It is possible to predict with some advance the state of the sea in an area; however, the full exploitation of this resource is problematic due to the inability to concentrate energy in a point for extraction. Therefore a source waves with higher capacity and continuity of energy output is not as well paid as wind or solar.

The current state is characteristic of a developing technology; there are still major challenges ahead that require heavy investment.

In today's market is far from competitive energy. The initial investment required for a project of this magnitude is very high and contains a component difficult risk to take. The devices away from the coast have an additional component due to the mooring system, which should be checked and replaced every so often. The trend over time is that technology is becoming more competitive with the rest thanks to, among other factors, the ability to build more powerful devices that reduce the cost per kW and improved yields.

The actual wave has a great irregularity in amplitude, phase and wave direction, the input power is totally random. Devices tend to try to follow the irregular profile, for this reason, the converters are equipped with a system that accumulates energy to soften the peaks that reach the generator. Nevertheless, it is difficult to obtain the maximum performance across the frequency range. Improvements are needed in the energy system yields.

As we have seen through the construction of a wave park on the Danish coast is completely feasible with a capacity factor of 50%.

Finally, because this is a project with a very wide scope, because it is an installation of a platform for marine generation in which many factors, the study was basically limited to the implementation of the platform marine generation on the Danish coast. Therefore, it is noted that this project can be extended with new and future contributions. Here are some points that could be further exposed:

- Performed a study and evaluate the environmental impact of a wind and wave farm offshore.

- Evaluate the dimensions of the floating platforms, which are required to adequately support the turbines.

- Study the calculation to transport electric power to the substation.

- Explore possibilities to expand an offshore wind farm already deployed and in service.

- Evaluate the implementation of other technologies for capturing wave energy, marine infrastructure advantage.

On the business point of view, we have made the marketing plan that can allow us to create a company called V&V Électricité, located in France. We will sell the energy that the wind and wave plant is going to produce. We are going to sell our energy in the French market, it is an open market, and after interviewing some companies we have decided to sell the electricity to companies from the agro-alimentary and agriculture sector; because according to our questionnaire it's the target group which are the most interesting about green electricity, but this same questionnaire alors help us to understand the profile of our potential customer and how can we attract them, for instance we figured out that whatever the economic sector companies with environmental policies were more interesting about green energy than companies with no links with ecology so we decided to extend our activities, to all companies with an environmental policy in a term of 5 years.

After analysing our competitors we have decided to position our company at the same price level as our competitor 'enercoop', 0.14€/kw but with additional services that position our company is service oriented. And concerning the annual subscription price we will be below 'enercoop' and above the other competitors, with a price of 900€.

Regarding the services, we will offer several services such as eco-environmental formation, energetic diagnosis, assistance EMAS or an ecologic communication plan.

The way we are going to reach our target group by different channels such as four commercial agents (one for each region), making phone calls, through internet. In relation to internet, we will develop our own website where it will be possible to purchase and also to find all the information regarding our company and our services. The state website comparator will aso be a way to reach potential customers.

The financial analysis help to figured out our sales objectives and the way to reach our customer by quantify our objective and exactly know how many will it cost to the company. By this way, we have been able to determine the turnover and benefits of the company.

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APPENDIX I

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APPENDIX I: Wind energy

1.1. Wind power

Wind turbines convert the kinetic energy of the mass of air passing through the area swept by the rotor blades into useful mechanical energy. Therefore, said in terms of energy, the kinetic energy is expressed as:

$$Ec = \frac{1}{2} * m * v^2$$

Furthermore, in stationary regime is considered that the mass flow, in this case the air is constant and can be expressed as:

$$m = \rho * A * v$$

Therefore, the total power available due to the movement of the air mass is:

$$P = \frac{1}{2} * \rho * A * v^3$$

Knowing that the area of a circle is$A = \pi \frac{D^2}{4}$In short, we can say that the mechanical energy that can be extracted from a free flow air stream by a power converter increases with the third power of wind speed and power increases linearly with the cross-sectional area of the converter route, therefore, increases with the square of its diameter.

On the other hand, can optimize the current wind angle to maximize the power of extracts according to the wind speed. Figure it can be seen using the MPPT, Maximum Power Point Tracking, you can extract the maximum power.

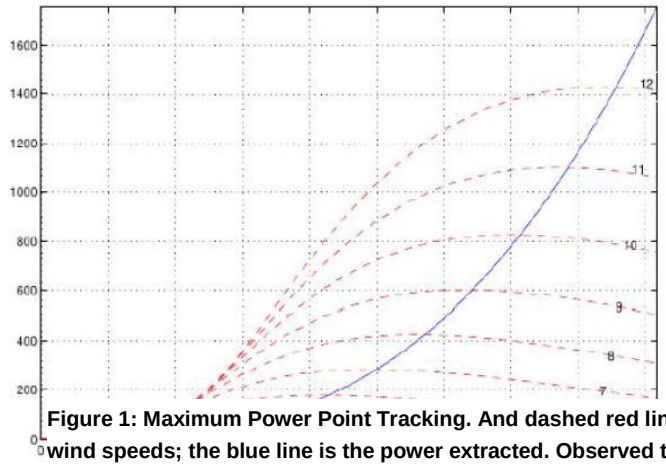


Figure 1: Maximum Power Point Tracking. And dashed red lines are the wind speeds; the blue line is the power extracted. Observed that the maximum advantage of the wind speeds.

The energy contained in this turn reduces the ratio of useful energy content of the total airflow in the cost of mechanical energy removable so that, in the theory of long run considering leaving the rotating power coefficient of the turbine must be less than the value according to Betz. Moreover, the coefficient of power now becomes a function of the relationship between the components of energy from the rotating movement and the movement of airflow. This ratio is determined by the tangential speed of the rotor blades relative to the unperturbed axial airflow, wind speed and tip speed ratio is called. A fundamental element of the curve of a rotor power coefficient is a function of tip speed ratio. Using the power coefficient C_{pr}, rotor power can be calculated as a function of wind speed, as follows:

$$P_R = \frac{1}{2} * C_{pr} * \rho * A * \ v_w{}^3$$

C_{pr}Power coefficient is calculated using the theory for a list of tip speed ratio. This proportional to the rotor power coefficient for different wind speeds at a fixed rotor speed or multi-speed rotor to a certain wind speed. If the rotor is equipped with a pitch control of the blades, power coefficient curves calculated for each angle of the blade used in the operation.

1.1.2. Aerodynamic power control

At high wind speeds, wind power captured by the rotor exceeds the limits set by the resistance of the rotor structure design. This is true of the turbines as large safety margins of the components endurance limits are narrower with increasing size of the turbine. In addition, the power output of the rotor is limited by the maximum allowable power generator. The speed limit becomes a matter of survival even when the generator is lost. In this case, the rotor speed increased rapidly and would result in the destruction of the turbine unless countermeasures were taken immediately.

1.1.2.1. Control of active power regulating the inclination of the blades

The driving forces can be reduced by aerodynamic influence the aerodynamic angle of attack, by reducing the projected area of the rotor sweep. The most effective way to influence the aerodynamic angle of attack, and therefore the input power is mechanically adjusting the pitch of the rotor blade. In principle, the power control load aerodynamic angle of attack of the rotor can be achieved by two methods. The conventional approach is by adjusting the angle of the blade at an angle smaller to reduce the input power. Conversely, increasing the angle of attack increases the input power. The other possibility is to change the pitch of the blade at an angle of attack higher up called critical angle of attack aerodynamic, point the air flow separates at the surface of the rotor blades. This effect is known as a stall. The advantage of this method is that the rotation angle necessary for the pitch of the blade is smaller.

1.1.2.2. Active stall regulation

To transfer the proven technology of stall controlled with a fixed angle of inclination of the blade to the range of energy systems greater. However, it was soon revealed considerable disadvantages of doing so. The loads experienced extreme wind speeds are also much higher stagnation that controls the passage of turbines. No less important, the loss charac-

teristics also make it difficult to calculate aerodynamically and reliably predict the increase in the size of the rotor.

Another problem is the influence of the air density at the beginning of the
Loss at different altitudes and geographic changes in temperature
Seasonal. To avoid loss of power source, a different angle of the blade has paid attention to select a lower air density, rotor speed and may have to be adapted.

As a result of all these problems, advocates the simple principle of stall controlled decide to change a more complex type of building, called active stall.

1.1.2.3. Passive stall regulation

No fixed blade with an adjustment of the pitch of the rotor, the stall is
Occurs with increasing wind speed and the tangential speed of the rotor remains constant. This mechanism is passive, self-regulation to control the input power rotor gives rise to its practical importance, especially for small turbines because in most cases do not have a blade pitch adjustment. At high wind speeds, the rotor power is limited only by the loss passing aerodynamic rotor blades.

The use of this type of regulation requires passive stall speed rotor geometry and carefully selected. To ensure that a particular wind speed, the flow is separate, so that an increase in power can effectively prevent the rotor is rotating at a speed less than the speed of rotation optimum aerodynamics.

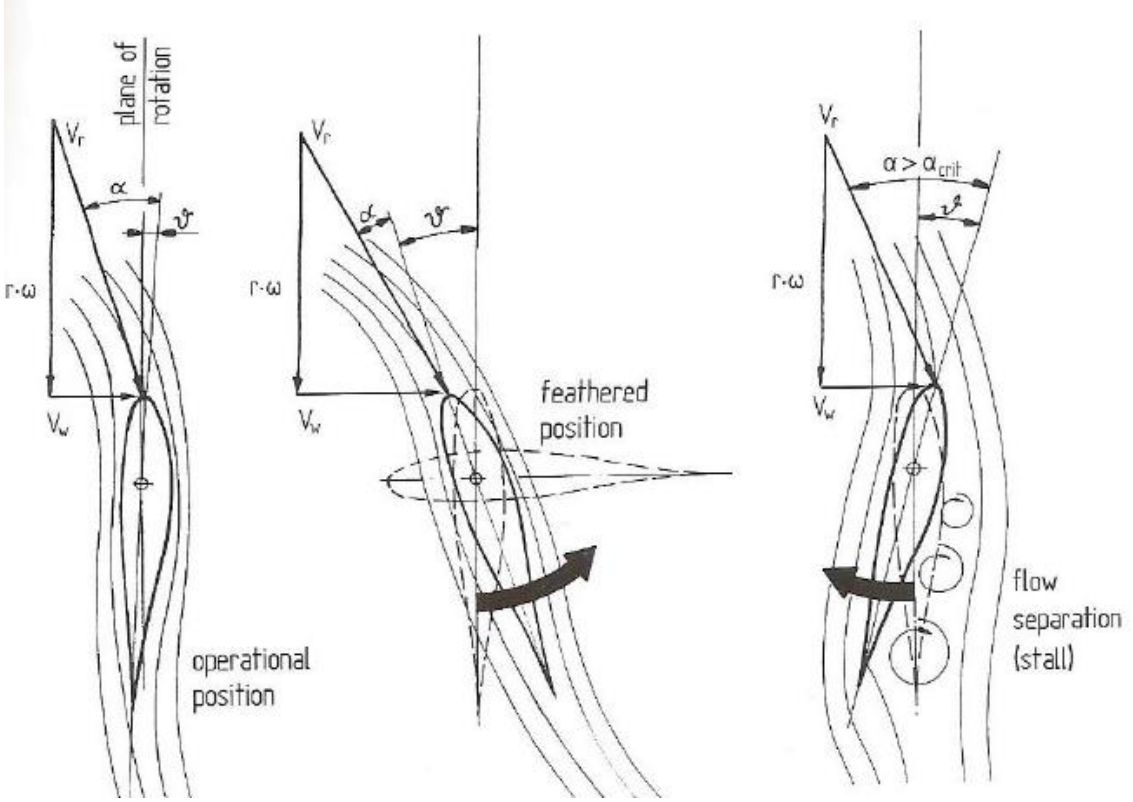


Figure 2: Controlled by the power angle. The first is out of control, the second is to increase the power with an increase in the angle and the third is to reduce the power by changing the angle towards the opposite direction.

On the other hand, the power curve drawn with respect to the wind speed can be defined in four stages, according to Figure 3.

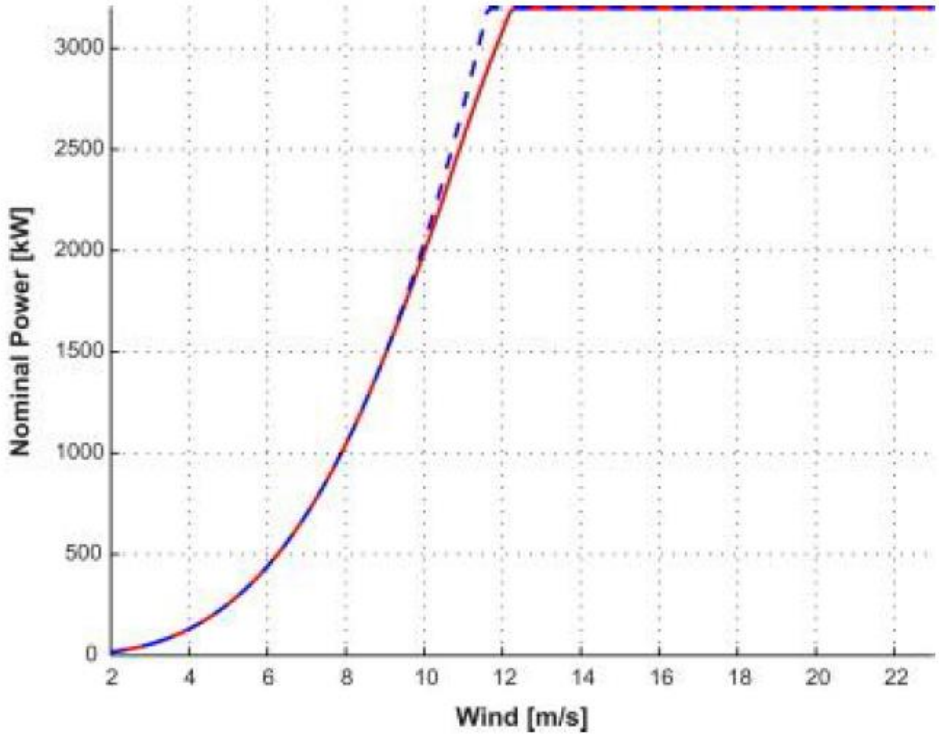
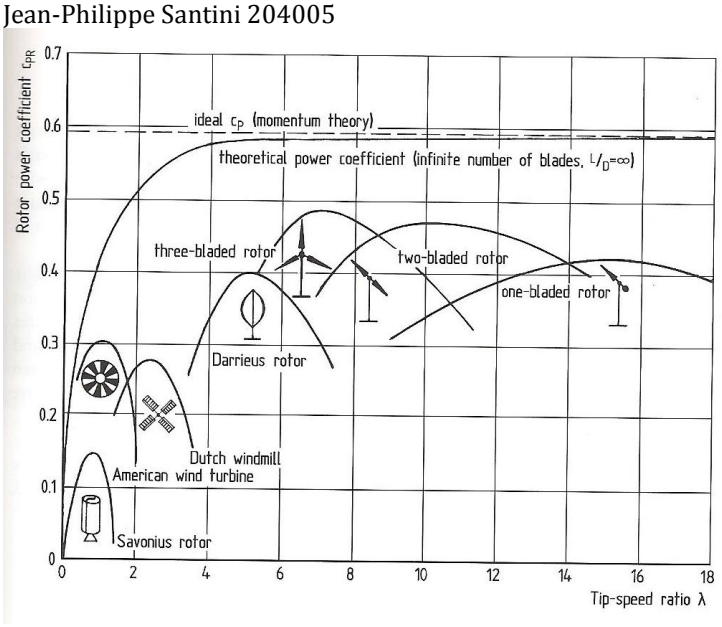


Figure 3: Graphical representation of power with respect to wind speed. Red line: Machine-restricted top speed, dashed line: machine unrestricted top speed. (Elsevier).

The first section is one section where wind speeds ranging from 0 to 3 m / s, the latter called speed boot speed is the minimum that is required to generate power. The second section is included from 3 to 10 m / s, this is an area where wind speed is low in order to extract the maximum energy by using the MPPT. The third section is the area where the wind speed range from 10 to 12 m / s in this speed range is a transition from low to high speed and the purpose of this zone is to maintain order the power generated in a margin of safety by using speed control without changing the angle of the blades. Finally, the last part is from 12 to 25 m / s, which is keeping the speed of the turbine at a maximum value and reduce the power drawn by changing the angle of the blades. As for the power coefficient, Cp; the limit is known as the Betz limit, that is, a value of 0.593 as it is above. Most wind turbines are currently operating 3 blades, so its coefficient is about 0.5 as shown in Figure 17. Regarding the air density can be considered an approximate value of 1.22 kg/m3.



Figur4: Cp values depending on the type of turbine.

Appendix II: Wind turbine selection

To know which is the viable wind turbine, in this section I have grouped the various parameters needed to calculate the wind energy production. In addition, we also have the technical characteristics of the four manufacturers. The power to the wind is given by the following mathematical expression:

$$P = \frac{1}{2} * \rho * A * v^3$$

Where C_p is the coefficient of power and is a very similar value for all wind turbines of the same type, in this case a fixed value 0,45; ρ is the density of the air and to simplify the calculations was determined a value of 1,2 kg/m3, A is the area swept by the wind turbine and Finally the wind speed v is expressed in
m /s.

The swept area of each turbine is 9852 m2 for V112-3.0, 9000 m2 for SWT-3.6-107, 12,469 m2 for Repower 5,0and 17,860 m2 forHaliade 150.

	V112-3.0	SWT-3.6-107	Repower 5.0	Haliade 150
Speed of wind (m/s)	Power (Kw)	Power (Kw)	Power (Kw)	Power (Kw)
0	0	0	0	0
1	0	0	0	4,822
2	0	0	0	38,5776
3	71,82	0	0	130,20
4	170,24	155,52	215,46	308,62
5	332,51	303,75	420,83	602,78
6	574,57	524,88	727,19	1041,60
7	912,39	833,49	1154,75	1654,01
8	1361,94	1244,16	1723,71	2468,97
9	1939,17	1771,47	2454,27	3515,38
10	2660,04	2430,00	3366,63	4822,20
11	3000	3234,33	4480,98	6000
12-25	3000	3600	5000	6000

Table1: Power curves for each of the selected wind turbines

2.1 Turbine power curve

Wind From the above table, I have represented graphically the curve power of each turbine, as can be seen in the Figures.

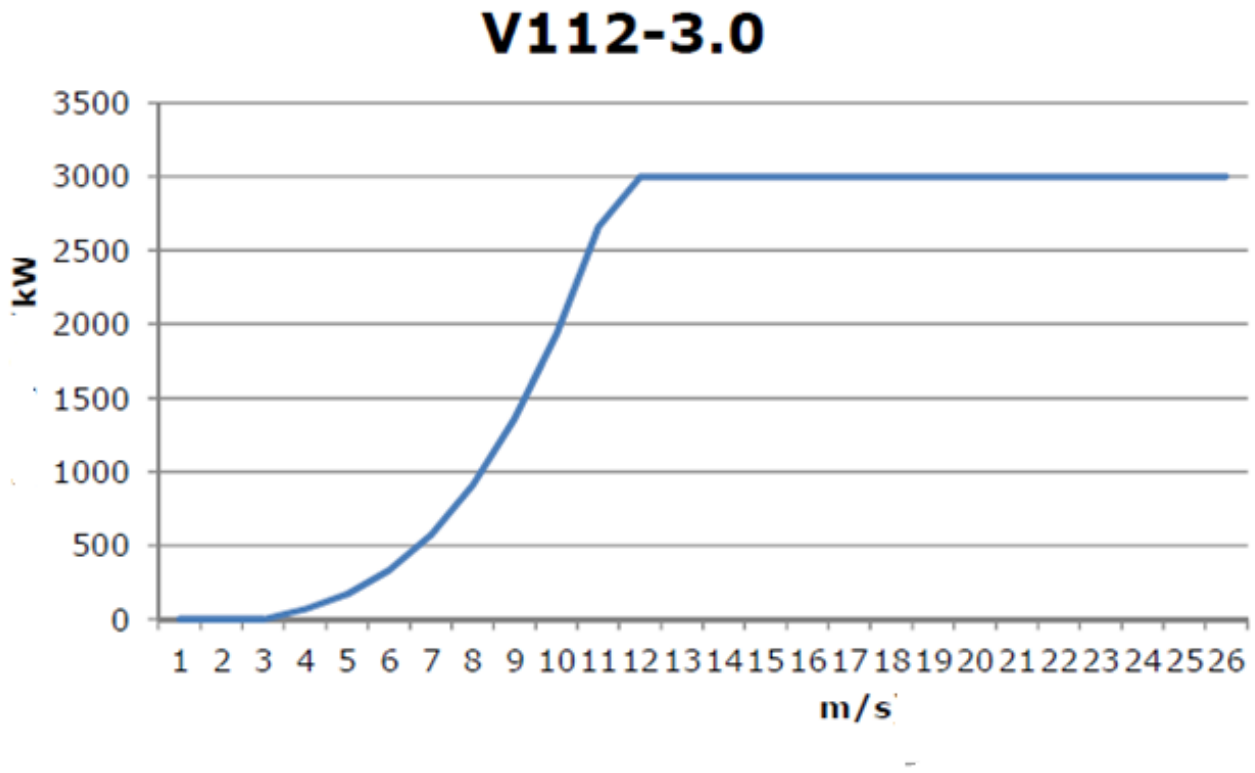


Figure 52: Power curve model manufacturer Vestas V112-3.0. (Own elaboration).

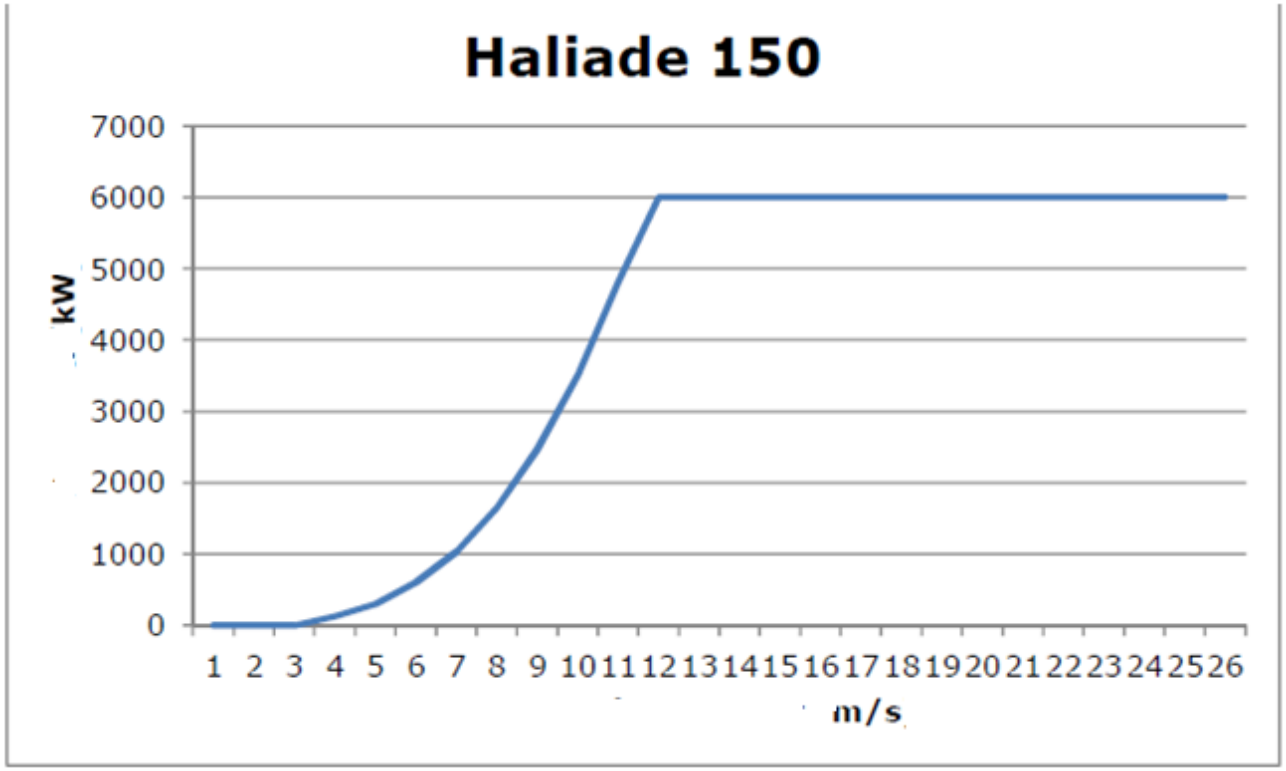


Figure 53: Power curve model Haliade 150 manufacturer Alstom. (Own elaboration).

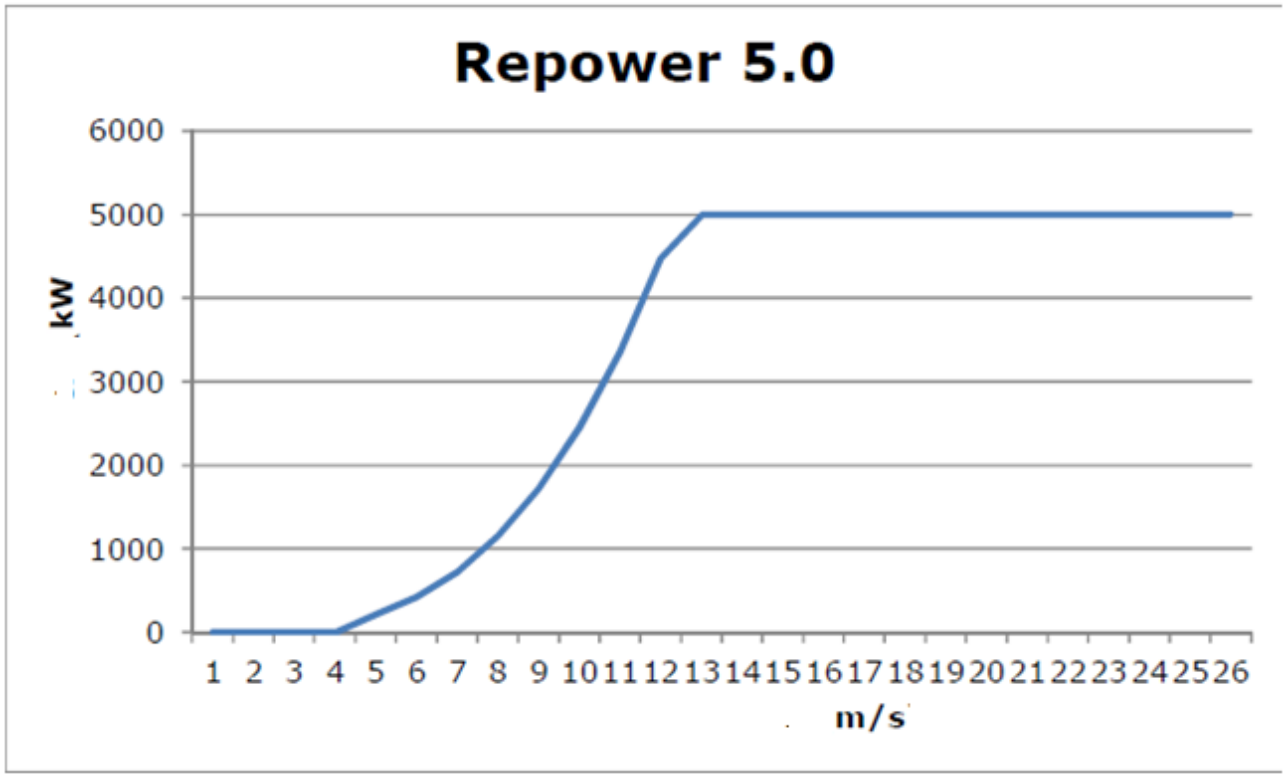


Figure 54: Power curve model manufacturer Repower Repower 5.0. (Own elaboration).

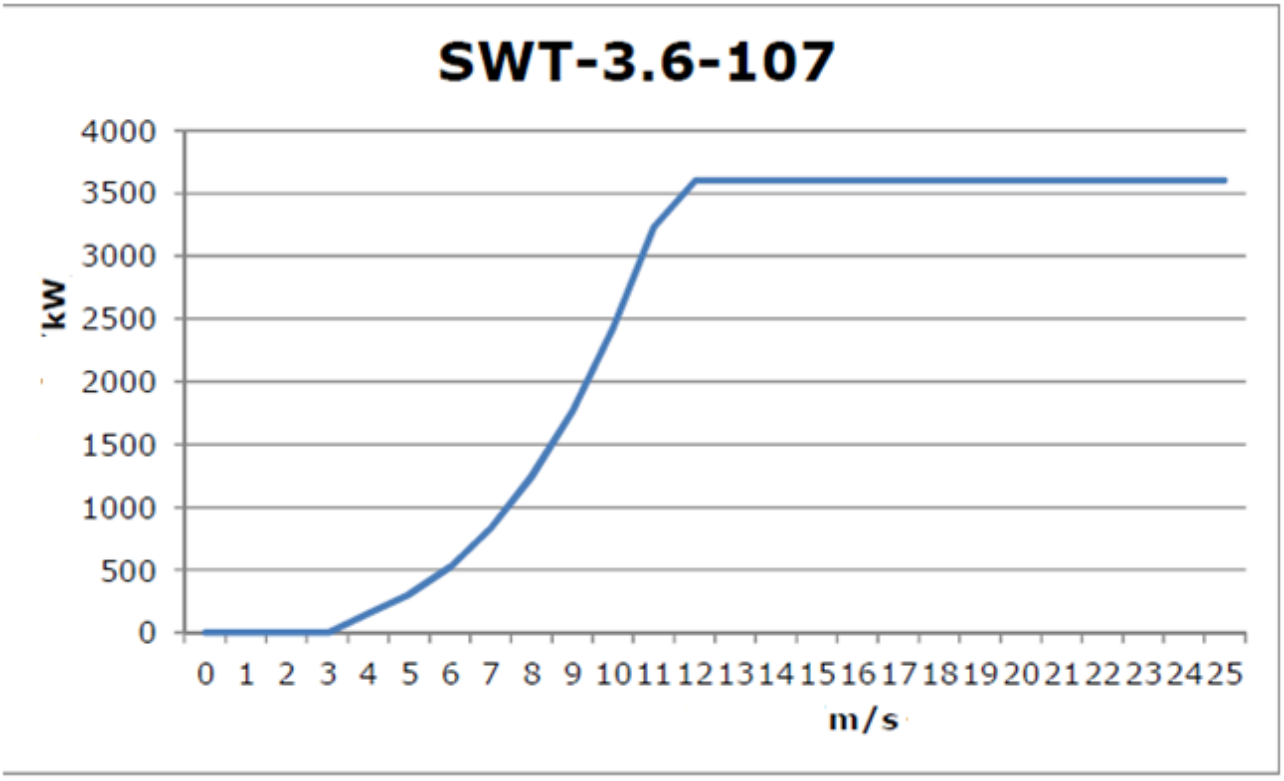


Figure 55: Power curve model SWT-3.6-107 manufacturer Siemens. (Own elaboration).

2.2 Frequency of wind speed

To learn about wind energy obtained in addition to the wind turbine power curve, we need to know the wind histogram with frequency. The calculations for this data are in the excel sheet.

Speed of wind (m/s)	Frequency (%)
0--1	0,95%
1--2	2,45%
2--3	4,45%
3--4	6,27%
4--5	8,22%
5--6	10,17%
6--7	11,49%

7--8	11,72%
8--9	11,35%
9--10	10,94%
10--11	7,90%
11--12	5,54%
12--13	3,59%
13--14	2,59%
14--15	1,18%
15--16	0,59%
16--17	0,09%
17--18	0,27%
18--19	0,18%
19--20	0,05%

Table 2: Frequency of speeds in Hanstolm for several years

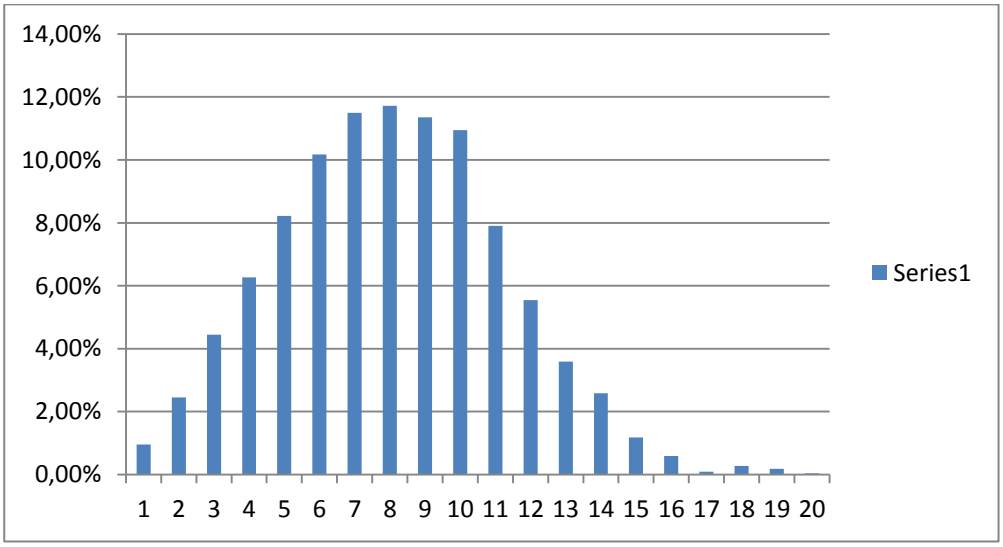


Figure 56: Graphical representation of the frequency histogram.(Own elaboration).

How we can see the frequency speeds are between 5 m/s and 11 m/s, because the rest of the speeds not represent nor 6.5%

It is chosen the Alstom Haliade 150 because produces more energy than others

2.3 Final energy

Finally, the wind power is the product obtained from each wind speed power curve, with his corresponding frequency and the number of hours there are for one year 8760 hours. The following Table shows the result of the wind power generated by one turbine in MWh/year.

Wind speed (m/s)	Energy (MWh/year)
1	0,402840654
2	8,287351455
3	50,76026158
4	169,4298572
5	434,034449
6	928,1876403
7	1664,736277
8	2534,091607
9	3496,222616
10	4623,267826
11	4153,242507
12	2912,043597
13	1885,667575
14	1360,544959
15	620,599455
16	310,2997275
17	47,73841962
18	143,2152589
19	95,47683924
20	23,86920981
TOTAL	25462,11827MWh/year

Table 3: Energy obtined for Haliade 150 in one year

2.4 Capacity Factor

It is now calculated to see if the wind farm is feasible

$$\frac{25462{,}11827 * 3}{(366\ days) * \left(24\frac{h}{days}\right) * 18\ MW} = 0{,}483 = 48{,}3\%$$

3. Excel sheet

I attach a table excel where I have done the calculations, in the first column it can seen the different wind speeds at the point of our installation, for a period of several years, the second column is the calculation of "Equation 1: Speed respect to hub height "which appears in paragraph 2.4.1 of the report. After I got the speed range from 0 to 1 1 to 2 ....etc and so to make the frequency table. Multiplying this table, the table of the turbine power and the number of hours in a year (8760), thus, it is obtained the final energy that a turbine produces in a year

Haliade™ 150-6 MW Offshore Wind Turbine

Specifications

OPERATING DATA	
Wind Turbine Class	I-B IEC-61400-1 / IEC-61400-3
Rated Power	6.0 MW (net after transformer)
Cut-in wind speed	3m/s
Cut-out wind speed (10 minutes average)	25m/s
Grid frequency	50 / 60Hz
ROTOR	
Rotor diameter	150m
Blade length	73.5m
Rotor swept area	17 860m²
Rotor speed range	4 – 11.5rpm
Tip speed	90.8m/s
GENERATOR	
Type	Direct Drive Permanent Magnet
Rated voltage	900V per phase
Number of phases	3 x 3
Protection class	IPP55
CONVERTER	
Type	Back to back 3-phase AC/AC
Output voltage	900V
TOWER	
Type	Tubular steel
Hub height	100m (or site-specific)
Standard color	RAL 7035
POWER CONTROL SYSTEM	
Type	Variable speed and independent pitch control by blade
ENVIRONMENTAL SPECIFICATIONS	
Normal air temperature range	-10 to +40°C
Extreme air temperature range	-30 to +50°C
Lightning protection	Class I acc. IEC 62305-1

The Alstom advantage

Alstom brings to offshore wind the strengths of a large and diversified power generation, transmission and transport infrastructure company. With over 100 years of experience with utility-size power projects, 30 years of wind turbine expertise, and extensive experience in offshore electrical infrastructure, Alstom has over 2.9 GW of offshore wind farm substations delivered or under construction.

For more information contact your Alstom representative:

Europe, Middle-East and Africa
Alstom
Roc Boronat, 78
08005 Barcelona
Spain

Phone: +34 932 257 600
Fax: +34 932 210 939

France
Alstom
4, avenue André Malraux
92309 Levallois-Perret
France

Phone: +33 1 41 49 2000
Fax: +33 1 41 49 24 85

North America
Alstom
100 Gateway Centre Parkway
Richmond, VA 23235
USA

Phone: +1 804 763 7676
Fax: +1 804 763 7675

www.alstom.com/wind

POWER ALSTOM

Patricia Zurano-Perez 206113
Irene Salinas 203955
Agustin Mesa Lombardo 206063
Jean-Philippe Santini 204005

APPENDIX III

COMPARISON OF SCALE FACTORS AND POWER PRODUCTIONS FOR PELAMIS

	Scale Ratio λ		Length (m)	∑kWh (in 120 days)	MWh/y	Not operative (0.5h)	P_{rated} (kW)	Capacity factor f (%)	Operating time (%)	Full load hours
(1)	1:1	1:180/180	180	200629	562	1149	750	9	78	749
(0.7)	1:1.4	1:180/126	126	114227	320	305	215	17	94	1486
(0.567)	1:1.8	1:180/102	102	72506	203	126	103	23	98	1977
(0.5)	1:2	1:180/90	90	52835	148	110	66	25	98	2232
(0.35)	1:2.9	1:180/63	63	17741	50	525	19	30	90	2604
(0.3)	1:3.3	1:180/54	54	9196	26	1247	11	26	76	2322
(0.25)	1:4	1:180/45	45	3743	10	2288	6	20	57	1789

Table 4: ScalefactorsforPelamis; Fernández-Chozas, J (2013)

HANSTHOLM-SCALE WEC POWER MATRIX

Pelamis Power Matrix for Hanstholm: rated power 103 kW - Defined for H_{m0} = 0.4 to 4.7 m and T_{02} = 2.6 to 7.1 s
Device lenght: 102 meters - Note: approx. Half scale of an Atlantic Pelamis

Power kW	T_{02} (s)																
H_{m0} (m)	2.7	3.0	3.2	3.5	3.8	4.0	4.3	4.6	4.8	5.1	5.4	5.6	5.9	6.2	6.5	6.7	7.0
0.6	0	3	4	5	5	5	5	5	5	4	4	4	3	3	0	0	0
0.9	4	7	9	10	11	12	12	11	11	10	9	8	7	6	6	5	5
1.1	8	12	16	19	20	21	21	20	19	17	16	14	13	11	10	9	8
1.4	12	19	25	29	32	33	33	32	30	27	25	22	20	18	16	14	13
1.7	18	27	36	42	45	47	45	43	40	36	33	30	29	26	23	20	18
2.0	0	37	48	57	60	60	58	55	52	50	45	40	36	32	29	28	25
2.3	0	0	63	69	74	75	73	68	65	59	53	50	46	41	37	32	29
2.6	0	0	75	87	88	89	86	81	77	72	65	59	52	49	46	41	36
2.8	0	0	0	101	99	100	97	94	92	83	76	71	65	57	51	48	45
3.1	0	0	0	103	103	103	103	103	101	91	90	80	73	68	61	54	49
3.4	0	0	0	0	103	103	103	103	103	103	97	87	85	76	70	64	57
3.7	0	0	0	0	103	103	103	103	103	103	103	102	90	85	79	70	66
4.0	0	0	0	0	0	103	103	103	103	103	103	103	103	93	84	80	72
4.3	0	0	0	0	0	0	103	103	103	103	103	103	103	103	94	85	81
4.5	0	0	0	0	0	0	0	103	103	103	103	103	103	103	103	95	86

Table 5: Hanstholm-scalewecpowermatrix. Fernández-Chozas, J (2013)

HANSTHOLM BUOY DATA FROM DANWEC

Table III, isbasedonananalysis of theexisting data onthe wave condition atHanstholmharbour. The data are fromtheperiod 31/05/13-31/05/14fromHanstholm (buoy 3110, approximately 2 km in front of theharbourentrance), UTM32N Euref89 coordinates: 474 700 E 6 332 100 N, at 17.5 m waterdepthfalilitatedbyDanWEC.

Isattachedanexcelsheetwithdetailed data.

Have	Tave	Prob.
0.0 - 0.5	4.48	0.01
0.5 - 1.0	3.67	0.18
1.0 - 1.5	4.01	0.22
1.5 - 2.0	4.30	0.18
2.0 - 2.5	4.57	0.12
2.5 - 3.0	4.85	0.09
3.0 - 3.5	5.02	0.06
3.5 - 4.0	5.23	0.04
4.0 - 4.5	5.40	0.02
4.5 - 5.0	Unavailable data	0.02

Table 6: Buoy data at Hanstholm

.

The sea statesherepresentedcover 94% of the total availablepower (92% ifexcluding, sea statebetweentherange 4.5-5.0m Have)

TOTAL POWER OBTAINED

Have	Tave	Prob.	Pw [KW]	Prob*Pw [KW]
0.0 - 0.5	4.48	0.01	5	0.05
0.5 - 1.0	3.67	0.18	19.5	3.51
1.0 - 1.5	4.01	0.22	33	7.26
1.5 - 2.0	4.30	0.18	58	10.44
2.0 - 2.5	4.57	0.12	70	8.4
2.5 - 3.0	4.85	0.09	100	9
3.0 - 3.5	5.02	0.06	103	6.18
3.5 - 4.0	5.23	0.04	103	4.12
4.0 - 4.5	5.40	0.02	103	2.06
4.5 - 5.0	Unavailable data	0.02	-	-
				TOTAL: 51 KW

Table 7: Total powerobtained

Patricia Zurano-Perez 206113
Irene Salinas 203955
Agustin Mesa Lombardo 206063
Jean-Philippe Santini 204005

PROCESS REPORT. PATRICIA ZURANO PEREZ

The project has been an enriching experience as a whole, I learned many new things about myseilf, working in a group and las but not least about the process and tools used to develop the project.

It have been in such a structured that way our group has divided the work from the beginning. First, we divided it into two parts, mechanical parts and bussiness. Both sides have had a few meetings, only at the beginning to agree with the structure of the project and regularly to share the data. In the mechanical part to which I belong, we started working together but seeing that there were two different big parts: each mienbro has specialized more in one than in another, but always being aware of the block that does not belong to us and taking together all decisions.

Numerous studies show the benefit of combining two types of renewable energy in a plant, and we wanted to get the most value from that. Studying data from waves and wind in a certain location of denmark, then project development and feasibility of a plant that combines wave and wind energy.

At first I thought the issue project would be an easier task but when I got involved more on the part of wave I found myself a little lost at the lack of info I had (not as develop technology such as wind turbines or the solar thermal). Then I realized that in part we made a mistake by placing the plant in Denmark, because on one hand it was our intention to do so is in this country where we are receiving our education along this year but later I realized the difficulties that it would bring me regarding to the language. An example is the web page where I could find the prediction data measurements. It took me a long time to find this page and also it is in Danish and has no translation.

I find renewable energies very interesting, since, it will never run out. There will always be waves crashing upon the shores of nations, near the populated coastal regions. The waves flow back from the shore, but they always return. Unlike fossil fuels, which are running out, in some places in the world, just as quickly as people can discover them.

Wave energy has achieved to fascinate me in this project, I personally think this energy is still underdeveloped and not very profitable in that aspect but in a few years will be one of the pioneers of all renewable energies.

Back to the group I would say
the group dynamics were interesting. Having in mind that the group members were from t wo different cultures, different motivaional levels, different personalities, there were no co nflicts. But as a whole from the four stages in the group dynamics, namely forming, stormi ng, norming and performing our group passed quickly through the forming and storming, a nd a bit slower through the norming and performing stage.
I believe that we barely reached the performing stage, where we work as a well-established team.

In my opinion, I think that working in groups is a great advantage, because when you work individually, may have many questions, but if you work in a group, your peers and you can help them.

PROCESS REPORT. AGUSTIN MESA LOMBARDO

When you talking about a problem, it is important that the whole group is well organized and arise many ideas to find the right solution, during the project we had a lot of problems but we learned adequately solve, looking for information from all or meetings with the supervisor.
The group members are two engineering students and two business students, we thought it would be interesting to mix these two university branches, design a product and then sell it…..
When we started to do the project, we decided that the engineers worked together and the marketing students would have the same, Patricia and I would calculate all the installations: The buoys system and wind turbine system. With this work I learned to work in a group that was something that I had never done, I always made individuals work, and in the engineering part, I learned to make wind turbines at the sea, something very important for engineer today.

VIA University College has had an important role in the development of this project because we have used enough academic material (programs with student license, refer-

ences of the library…), installations (computers, meeting rooms, projectors…) and our supervisor UffeVestergaardPoulsen has solved our problems and questions.

Also we have received help from other students and we have helped to other friends with some specific questions of their projects. This make the teamwork a great experience and, for me, has been a big learning about topics I didn't know before.

The result of the project has been very satisfying, because we divide each part very well, and we link them all has been a big project, which I think will be very interesting for teachers to consider us,

AlwaysI knew wanted to do a project on renewable energy as it is the energetic future and especially in Denmark, there are many wind farms, biogas, etc.. I think it was the perfect country to investigate the creation of a wind farm

PROJECT DESCRIPTION

Jean-Philippe Santini 204005
Irene Salinas 203955
Augustin Mesa Lombardo 206063
Patricia Zurano Perez 206113

Supervisors:
Uffe V.Poulsen
Peter Harboe

VIA UNIVERSITY COLLEGE

Background description

Today the environment and its conservation is a challenge for the safety of our planet. Many efforts and innovations have been made in recent decades to improve the impact of the modern way of life on environment. In this context renewables energies constitute a viable option to make the planet less polluted and more durable for the future generations. These energies, which unlike fossil fuels do not pollute the environment, provide energy with an environmental impact close to zero or even none. Those sources of so-called “green" energies are both very dynamic economic sector and carrier but also a path that would put in place a more sustainable and less polluting society.

In 2010 according to the (French National Institute of Applied Sciences 2012), hydroelectricity represents 82,9% of the total of renewable energy created in the world, and wind turbines represents 8,3%. For the time being the creation of green energies is dependent of those two sources. But there are other sources still underdeveloped which represents of future great potential; this is the case of the marine energy which only represents 0,6% of the total production of green energies.

It is, in this context that we would focus our project in an original source of renewable energy, the wave energy.

The waves are the result of the effect of wind blowing over hundreds or thousands of miles offshore , resulting in a transfer of energy to the ocean surface . Therefore, they are a form of kinetic energy that can be accessed using various mechanisms, capturing some of its energy . Definitely, the wave energy is harnessing the kinetic and potential energy of waves to produce electricity.

The unequal heating of the Earth's atmosphere generates wind, and the wind generated waves. Only 0.01% of the flow of solar energy is transformed into wave energy . One of the characteristic properties of waves is their ability to travel long distances with little energy loss. Therefore, the energy, which is generated anywhere in the ocean,is finished just in the continental edge , so its energy is concentrated on the coasts.

The energy contained in the waves varies from place to place , but in general , the further away they are from equator, they contain more energy. Although local conditions , such as type of coast , where they generate and deep ocean , take great importance in the amount of energy . According to estimates , it can be assumed that the wave energy flow in Euro

pe could amount to 1,000 TWh per year, amounts to take into account for a future expansion in the use of this type of energy.

The main disadvantage of this type of energy is the high investment required for the installation of buoys and turbines and moderate environmental impact. Its great advantage is that it is a sustainable renewable energy that take advantage of an inexhaustible natural resource such as waves, increasing energy independence, and when the system is amortized, it generate power at very low costs. Also promote the use of energy from waves, generate more green jobs and progress towards a more sustainable economy.

Purpose

Mechanical Purpose: Our task project has a number of requirements that are important and they are all connected somehow. For our main purpose, we would like to focus on building a platform for obtaining energy from wave motion and install wind turbines on the same platform. In achieving this goal, we will also meet our high priorities to develop the best way to get energy from the waves as it is a field that is still much to investigate and we would like to inquire on this topic. At the end of the project we expect to have a product that can be built and used later.

On the business part of our project the goal is to get an overall idea of the market of energy and renewable energy in the World, Europe and France, with its main actors (competitors), its trends and the demand of customer to define a valuable marketing plan.

Problem formulation

- <u>How can we install a wave energy system in Danish coast ?</u>

  We want to study the best system for obtaining wave energy and make the project facility and calculations necessary to build the wave energy platform.

- <u>How can we develop obtaining energy from ocean waves ?</u>

  We choose a system invented and install it, we will investigate on how to increase system performance

- <u>Who will be our target group in terms of potentials customers or investors?</u>

- What is the current state of the market of renewable energy?

In terms of market growing, actors in the market, price development, trends...

- Where locate our platform?
- What is the current state of the energy market, at Global, European and French level?
- Who will be our target group? To define the target group is one of the most important issues so we'll study our potential customers and try to fulfil their needs.
- Define the trends, motivations, and brakes of the potentiels customer of green electricity?
- What is the current competition on the market and what is their strategy?
- What could be the best Marketing Plan for a green energy supplier to implement the French electric market?
- Then when we define our target group, how to reach them?
- Which sales strategy set up? Objectives?
- What will be the cost of this sales strategy?
- Does the company could have benefits with the Marleting Plan that with set up?

Delimitation

In this project we are going to focus on the development of the business plan for our new company. Since we do not have university formations law, we will not discuss the legal aspects and the various agreements required the implantation of electric power plants in the territorial waters.

This project not take care of the cables that carry the energy to the coast and also it not take care of the energy management once it leave the area offshore.

Choice of models and methods

In the business idea, we try to think about current global problems that may require a solution according to our knowledge field. The objective of this part is to present and explain shortly all the model and different methods that we will use to accomplish our project.

1. Knowing the market of Energy, Renewable Energy and Wave Energy, the aim of this task is to have an overall image of the situation of the market (threats and op-

portunities), to figure out what could be the best positioning for us. The model that we will use, consist on an analysis of the environment (macro and micro) to choose a specific segment of the market, to differ of our competitors. At the end of this task we will make a analysis of our findings, this analysis will help you for determine the business model of our company. This analysis will also be helpful for the mechanicals students because they should use the study market to create an innovative and different product.

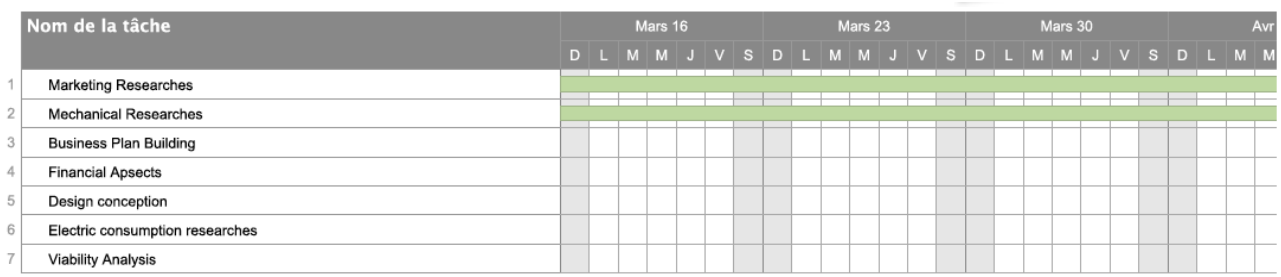
2. Competitors Analysis in order to make Benchmarking, find the positioning of competitors on the market and try to position our company.
3. Creation and application of a questionnaire in order to know the demand of potentiel customer.
4. Marketing Plan Template from the book “How to write a successful Business Model” by Stephen Lawrence and Frank Moyes from University of Colorado.
5. Financial data, it is very important in order to know if the business is going to be profitable and if it could be continued on the time, in other words, see if the business is going to succeed.

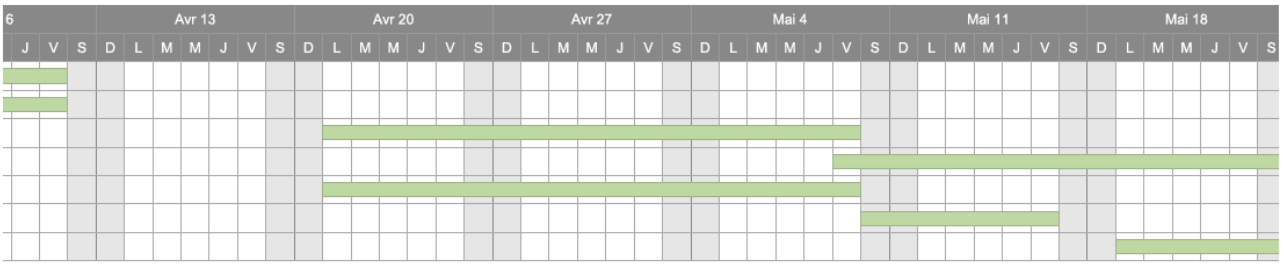
- Models and methods for the Mechanical part of the project:

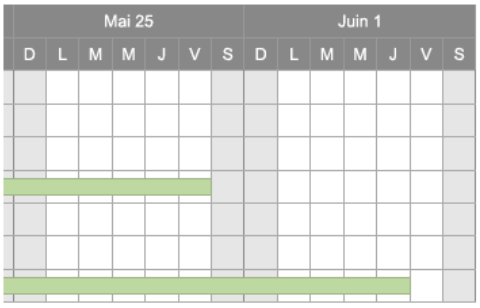
    1. Study the best location in Denmark where will be installed wave energyplatform, for this, will be used the "European Wind Atlas" and also will be looked information on Internet.
    2. Choose the best system for producing energy in the chosen location (the type of wind turbine and type of marine buoy)
    3. Financial data, in this part, wil be obtained the price of everything that is needed (wind turbines, buoys, work ...) and willbe passed this data to the business group.
    4. Make the calculations necessary for the installation of the maritime platform, firstly the foundations necessary for the structure of the wind turbines and installation of these (calculate the stress, etc). After, the installation of marine buoys with his necessary calculations

Time schedule

Patricia Zurano-Perez 206113
Irene Salinas 203955
Agustin Mesa Lombardo 206063
Jean-Philippe Santini 204005







Patricia Zurano-Perez 206113
Irene Salinas 203955
Agustin Mesa Lombardo 206063
Jean-Philippe Santini 204005

BUSINESS' APPENDIX

Questionnaire

RESULTS OF THE FRENCH QUESTIONNAIRE

Chez Toinette	Yes	No	Why?	Choice	Aditional infos / others
Question 1					EDF
Question 2		No			13
Question 3	Yes				Kitchen Devices and lights in the main r
Question 4				Quality and price competitive	
Question 5				Very satisfie	Prices are regular and customer service
Question 6		no			
Question 7					
Question 8				Internet	because its the easiest and fastest way
Question 9		no			
Question 10		no			not very interesting for my business
Question 11				Environmental awarness	
Question 12				5%	

Cap Conseil	Yes	No	Why?	Choice	Aditional infos / others
Question 1					EDF
Question 2	yes				10
Question 3					Computer and lights
Question 4				Quality, Service	
Question 5			expensive	moderatly satisfied	
Question 6	yes		issues bills w		mit of the trial)
Question 7				Directors	
Question 8				internet or provider office	
Question 9		no			
Question 10		no			he knew for individuals but not for B2B
Question 11				Environmental Awarness or in case of state subsidies	
Question 12				5%	

Radis Noir	Yes	No	Why?	Choice	Aditional infos / others
Question 1					Direct Energie
Question 2	yes				4
Question 3	yes				computers and light
Question 4				Quality, Novelty Technology	
Question 5			low prices	Very satisfied	
Question 6	yes		to find a che		
Question 7					Director
Question 8				internet or call a competitor's commercial service	
Question 9		no			
Question 10		no			price
Question 11				Branding	
Question 12				5%	20

Biovercité	Yes	No	Why?	Choice	Aditional infos / others
Question 1					GDF Suez
Question 2					55 hectares of lands / 14 employees
Question 3	yes				for the production of oil and flour
Question 4			Organic certi	ecologic responsibility, quality	
Question 5			never really t	very satisfied	
Question 6		no			
Question 7					
Question 8				internet	
Question 9	yes				Organic agriculture
Question 10	yes			word to mou	price
Question 11				environmental awarness and branding	
Question 12				20%	

Vieux campeu	Yes	No	Why?	Choice	Aditional infos / others
Question 1					EDF
Question 2	yes				50
Question 3	yes				except computer and light
Question 4				price competitive, quality	
Question 5			efficient, alw	very satisfied	
Question 6		yes	during the op		city market in 2007, but didn't find equiv
Question 7					Director for all the shops, or purchasin
Question 8				independant consultant	
Question 9	yes				strategy focused on nature and outdoo
Question 10	yes			internet	stable prices commtiment from the sup
Question 11				branding and environmental awarness	
Question 12				20%	in the case of insurance of a stable price

Ferme Grillet	Yes	No	Why?	Choice	Aditional infos / others
Question 1					EDF
Question 2					9000 chickens for meat and eggs / 8 employees
Question 3	yes				Most electric lighting and heating incubators
Question 4				Quality, ecologic responsibility	
Question 5			high consum	very satisfied	
Question 6		no			
Question 7				farmer	
Question 8				internet first and provider office	
Question 9	yes				Organic production
Question 10	yes			television	the farmer thought it was reserved for small consumers
Question 11				environmental awarness and branding	
Question 12				20%	

Patricia Zurano-Perez 206113
Irene Salinas 203955
Agustin Mesa Lombardo 206063
Jean-Philippe Santini 204005

Ferme Capcde	Yes	No	Why?	Choice	Aditional infos / others
Question 1					EDF
Question 2					3 employees/ 44 cows and 122hectares
Question 3	yes				Cold room, light, heating
Question 4			organic prod	Quality and ecologic responsibility	
Question 5			never had a	very satisfied	
Question 6		no			
Question 7				Farmer	
Question 8				Independant consultant	
Question 9	yes				organic certifications
Question 10	yes			television	breaks: taught that it was reserved to in
Question 11				Environment	in line with my work, branding of my pr
Question 12				30%	electricity doesn't represent a large cha

Petit Basque	Yes	No	Why?	Choice	Aditional infos / others
Question 1					Planet Yes
Question 2					30 employees
Question 3	yes				production and conditioning of yoghourt (semi industrial but
Question 4			strategy of th	Quality, social and ecologic responsibility	
Question 5			very satisfied	green energy	
Question 6	yes				and i did from EDF to Planet Yes
Question 7				director was involved	
Question 8				provider offi	for better advices
Question 9	yes				organic certifications, ecologic buildings and green electricity
Question 10	yes			event	no breakes (maybe at the begining no set back on those new
Question 11				branding, environmental and social awarness	
Question 12				30%	

GAEC des mar	Yes	No	Why?	Choice	Aditional infos / others
Question 1					Mistral (regional supplier non member
Question 2					5 employees / 50 cow and exploitation
Question 3	yes				heating, lighting, cold room, negative ar
Question 4			Quality	prices of my products are homemade organic and mo	
Question 5			very long tim	very satisfied	
Question 6		no	i'm satisfied		
Question 7				farmer	
Question 8				internet	
Question 9	yes				organic production
Question 10	yes			newspaper	i'm not sure about the fiability, origin of
Question 11					envronmental awarness and branding
Question 12					20%

Soy	Yes	No	Why?	Choice	Aditional infos / others
Question 1					EDF
Question 2					35 employees
Question 3	yes				production and conditioning of Organic prepared food
Question 4				Quality	
Question 5			Very satisfie	Very satisfied	
Question 6		no			
Question 7				directors	
Question 8				independent consultant	
Question 9	yes				eco building and organic product (no green electricity)
Question 10	yes			newspaper	breaks: price and uncertainty about those offer where the en
Question 11				branding and environmental awarness	
Question 12					20%

Château de Bo	Yes	No	Why?	Choice	Aditional infos / others
Question 1					EDF
Question 2					7000 bottles, 8 employees, 30 during
Question 3	yes				stages of production and packaging, aut
Question 4			mid range price wine	Quality and price competitive	
Question 5			prices rising	more or less satisfied	
Question 6	yes		to find a che		
Question 7				director	
Question 8				Internet	
Question 9	yes				organic certifications
Question 10	yes			word to mou	prefered keep the security with EDF
Question 11				Environmental Awarness (branding in a lesser extent	
Question 12				20%	

Fromagerie F	Yes	No	Why?	Choice	Aditional infos / others
Question 1					EDF
Question 2					40 employees
Question 3	yes				semi-industrial production of Roquefort cheese from organic
Question 4			high end pro	quality	
Question 5			nothing to co	very satisfied	
Question 6		no			
Question 7				directors, accounting services	
Question 8				independant consultant	
Question 9	yes				organic product
Question 10	yes			internet	breaks: i knew for individuals but not for companies
Question 11					subsidies from the state
Question 12					20%

Earl Bioferme	Yes	No	Why?	Choice	Aditional infos / others
Question 1					Enercoop
Question 2					2
Question 3		no			artisanal production, without machines
Question 4			organic prod	quality and ecologic responsibility	
Question 5			green energy	very satisfied	
Question 6	yes				and he did
Question 7				farmer	
Question 8				internet	easiest way
Question 9					organic products (certified)
Question 10		no			
Question 11					Environmental awareness
Question 12					30%

Bralo	Yes	No	Why?	Choice	Aditional infos / others
Question 1					EDF
Question 2	yes				200
Question 3	yes				industrial materials production
Question 4			high competition		price competitive, novelty technology
Question 5			more or less satisfied		to expensive
Question 6	yes				price
Question 7				board	
Question 8				independant	more professional, he knows my needs
Question 9		no			
Question 10		no			breaks: price and not usefull for the branding
Question 11					Environmental awareness
Question 12					5%

Cair LGL	Yes	No	Why?	Choice	Aditional infos / others
Question 1					GDF Suez
Question 2	yes				105
Question 3	Yes				medical product manufacturing (all pro
Question 4			medical prod	Quality, novelty technology	
Question 5			double offer	very satisfied	
Question 6	yes		i changed du		et opening
Question 7				director and accounting service	
Question 8				commercial	because i can negotiate the price with c
Question 9		no			
Question 10		no			breaks: i consumme a lot of energy
Question 11				environmental awarness	
Question 12					10%

Moulaire	Yes	No	Why?	Choice	Aditional infos / others
Question 1					EDF
Question 2	yes				62
Question 3	yes				foundry
Question 4				quality	
Question 5			very satisfied	double offer	gas and electricity (cheaper)
Question 6		no			
Question 7				director	
Question 8				independant consultant	
Question 9		no			
Question 10	yes			television	breaks: don't know for companies and not very sur about fiability
Question 11				state subsidies, taxes agreement	
Question 12					10%

Domibio	Yes	No	Why?	Choice	Aditional infos / others
Question 1					Planet Yes
Question 2		no			28
Question 3		no			not really because we don't manufactu
Question 4			eco-certifica	Eco responsibility and quality	
Question 5			green energy	very satisfied	
Question 6	yes				to have green energy
Question 7				director	
Question 8				internet first and provider office then	
Question 9	yes				eco- responsible company (neutral carb
Question 10	yes			word to mou	business fellows
Question 11				branding, environmental awarness	
Question 12				ff	30%

Courb	Yes	No	Why?	Choice	Aditional infos / others
Question 1					EDF
Question 2	yes				8
Question 3	yes				assembly line
Question 4			electric car n	Social, Ecologic responsibilit and yquality	
Question 5			prices increa	moderatly satisfied	
Question 6	yes		for the price		ergie
Question 7				board	
Question 8				independant consultant	
Question 9	ecologic and				
Question 10		no			breaks: price and electricity's origin
Question 11				state subsidies, branding	
Question 12					15%

Patricia Zurano-Perez 206113
Irene Salinas 203955
Agustin Mesa Lombardo 206063
Jean-Philippe Santini 204005

BASF Agro	Yes	No	Why?	Choice	Aditional infos / others
Question 1					EDF
Question 2	yes				100
Question 3	yes				crop protection products "(herbicides, i
Question 4				Novelty Technology, Quality	
Question 5			Feed our nee	Very satisfied	
Question 6		no			
Question 7				board	
Question 8				independant consultant	
Question 9		no			
Question 10	yes			newspaper	breaks: security protocole in our plant a
Question 11				state subsidies	
Question 12					5%

Green Unive	Yes	No	Why?	Choice	Aditional infos / others
Question 1					Planet Yes
Question 2	yes				10
Question 3		no			computer, lights, heating
Question 4				novelty technology and ecologic responsibility	
Question 5			green energy	very satisfied	
Question 6	yes		to have gree		
Question 7				director, accounting service	
Question 8				customer ser	because i can have advices
Question 9	yes				ecologic newspaper
Question 10	yes			business fellows	
Question 11					⟨ Environmental awareness
Question 12					20%

Genzyme	Yes	No	Why?	Choice	Aditional infos / others
Question 1					EDF
Question 2	yes				240
Question 3	yes				laboratory researches for rare health di
Question 4				Novelty Technologiy	
Question 5			secured offe	Very satsified	
Question 6		no			
Question 7				board,	
Question 8				independant consultent	
Question 9		no			
Question 10	yes			television	breaks: not interresting for our business
Question 11				subsidies from the state	
Question 12					5%

Citadium	Yes	No	Why?	Choice	Aditional infos / others
Question 1					Direct Energie
Question 2	yes				40
Question 3		no			light, heating, air conditioning
Question 4				price competitvness	
Question 5			price	very satisfied	
Question 6	yes				i did because of the price
Question 7				direcotr	
Question 8				independent consultant	
Question 9		no			
Question 10		no			breaks: price
Question 11				if the state gives subsidies	
Question 12					10%

Alvoe	Yes	No	Why?	Choice	Aditional infos / others
Question 1					EDF
Question 2	yes				62
Question 3	yes				recycling computer devices
Question 4			part of our w	price competitive and ecologic responsbility	
Question 5			inefficient cu	not all satisfied	
Question 6	yes		lack of effect		
Question 7				director, accounting service	
Question 8				provider office	
Question 9	yes			recycling	
Question 10		no		breaks: price	
Question 11				branding, environmental awarness	
Question 12					15%

Ulule	Yes	No	Why?	Choice	Aditional infos / others
Question 1					Directe Energie
Question 2	yes				8
Question 3		no			light, heating, air conditioning
Question 4			part of my st	novelty techonology and social responsibility	
Question 5			inefficient cu	more or less satisfied	
Question 6	yes		because of th		
Question 7				director	
Question 8				internet	
Question 9		no			
Question 10	yes			internet	not for companies breaks: prices
Question 11				environmental awarness	
Question 12					15%

CleanTech	Yes	No	Why?	Choice	Aditional infos / others
Question 1					EDF
Question 2	yes				20
Question 3		no			computer, lights, heating, air conditioning
Question 4				novelty technology	
Question 5			prices indrea	moderatly satisfied	
Question 6	yes		find somethi		
Question 7				director, accounting service	
Question 8				internet	
Question 9	yes				support cleantech companies
Question 10	yes			internet	breaks: price
Question 11				State Subsidies	
Question 12				15%	

Patricia Zurano-Perez 206113
Irene Salinas 203955
Agustin Mesa Lombardo 206063
Jean-Philippe Santini 204005

ANALYSIS OF THE RESULTS

Current Supplie	Employees	Machines
EDF	105	yes
GDF Suez	200	yes
EDF	62	yes
EDF	28	yes
Direct Energie	8	yes
EDF	62	yes
EDF	100	yes
Mistral	240	yes
EDF	13	yes
Planet Yes	4	yes
EDF	4	yes
EDF	50	no
EDF	11	yes
EDF	40	yes
EDF	20	yes
Enercoop	10	no
GDF Suez	8	yes
Planet Yes	11	yes
EDF	14	yes
Planet Yes	8	yes
Direct Energie	3	yes
Directe Energie	5	yes
EDF	8	yes
EDF	30	yes
EDF	35	yes
	40	

Office Machines	8
Production of a	7
production of ir	7

44,76	EDF	15
20	Direct Energi	3
17,11111111	Enercoop	1
100,625	Planet Yes	3
	Mistral	1
	GDF Suez	2

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Irene Salinas 203955
Agustin Mesa Lombardo 206063
Jean-Philippe Santini 204005

parameter of image	Satisfaction		Why
quality	Very satisfied		Prices are reg
quality	moderatly satisfied		expensive
ecologic responsibility	Very satisfied		low prices
Quality	very satisified		never really t
price competitive	very satisfied		efficient, alw
Quality	very satisfied		high consum
Ecologic Responsibility	very satisfied		never had a p
Quality	very satisfied		very long tim
Quality	more or less satisfied		prices rising i
Ecologic Responsibility	very satisfied		green energy
quality	Very satisfied		
Ecologic Responsibility	very satisfied		nothing to cc
price competitive	very satisfied		green energy
quality	very satisfied		double offer
Social responsibility	very satisfied		green energy
quality	more or less satisfied		too expensiv
Quality	very satisfied		double offer
Eco responsibility	moderatly satisfied		prices increa
novelty technology	Very satisfied		Feed our nee
price competitvness	Very satsified		secured offe
novelty techonology	not at all satisfied		inefficient cu
Novelty Technology	very satisfied		green energy
Novelty Technologiy	very satisfied		price
price competitive	more or less satisfied		inefficient cu
price competitive	moderatly satisfied		prices indrea
service			
quality			
Novelty Technology	Very satisfied	18	
quality	Moderatly satisfied	3	prices increa
ecologic responsibility	More or less satisfied	2	expensive
Ecologic Responsibility	Not at all satisfied	1	inefficient cu
social responsibility			
price competitive		prices are re	2
ecologic responsibility		low prices	4
novelty technology		Fiability	5
ecologic responsbility		Efficiency	3
Quality		Long term re	1
social responsibility		green energy	4
ecologic responsibility		double offer	2
quality			
novelty technology			
ecologic responsibility			
Quality	15		
Price Competitive	6		

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Irene Salinas 203955
Agustin Mesa Lombardo 206063
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secondary	which one	tertiary	Which one	Do you know	Where did yo	1
no		no		no		yes
no		no		no		yes
no		no		no		yes
yes	Eco-responsi	yes	strategy focu	yes	internet	yes
yes	Ecologic and	yes	ecologic new	yes	word to mou	yes
no		no		yes	television	yes
no		no		yes	television	yes
yes	recycling	yes	support Clea	yes	ecologic ever	no
:ulture				yes	nexspaper	yes
				yes	Business Fellows	
				yes	internet	
no	5	no	5	no		yes
yes	3	yes	3	yes	event	8
				yes	television	no
				no		1
				no		
				yes	business fellows	
				yes	newspaper	
				yes	television	
				no		
				no		
				yes	business fellows	
				no		
				yes	internet	
				yes	internet	
				yes	15	
				no	10	
				internet	4	
				Business Fell	4	
				Professional	2	
				Television	4	
				Newspaper	2	

Patricia Zurano-Perez 206113
Irene Salinas 203955
Agustin Mesa Lombardo 206063
Jean-Philippe Santini 204005

secondary	which one	tertiary	Which one	Do you know	Where did yo	1
no		no		no		yes
no		no		no		yes
no		no		no		yes
yes	Eco-responsi	yes	strategy focu	yes	internet	yes
yes	Ecologic and	yes	ecologic new	yes	word to mou	yes
no		no		yes	television	yes
no		no		yes	television	yes
yes	recycling	yes	support Clea	yes	ecologic eve	no
ulture				yes	nexspaper	yes
				yes	Business Fellows	
				yes	internet	
no	5	no	5	no		yes
yes	3	yes	3	yes	event	8
				yes	television	no
				no		1
				no		
				yes	business fellows	
				yes	newspaper	
				yes	television	
				no		
				no		
				yes	business fellows	
				no		
				yes	internet	
				yes	internet	
				yes	15	
				no	10	
				internet	4	
				Business Fell	4	
				Professional	2	
				Television	4	
				Newspaper	2	

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Irene Salinas 203955
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			ecologic policy			
			yes	20%		
			no	5%		
Price	2		no	5%	5%	22%
Only knew fc	4		no	5%		8%
Electricity Or	2		yes	20%		
Uncertainty a	1		yes	20%		
			yes	30%		
price	4		yes	30%		
Not very inte	1		yes	20%		
Uncertainty	1		yes	20%		
Only know fc	1		yes	20%		
			no	5%		
price	3		yes	30%		
Reliability	2		no	10%		
Seciurity pro	2		no	10%		
Origin of the	1		yes	15%		
			yes	30%		
			no	5%		
			no	5%		
			no	15%		
6			yes	20%		
3			no	10%		
4			yes	15%		
8			yes	15%		
4						

Patricia Zurano-Perez 206113
Irene Salinas 203955
Agustin Mesa Lombardo 206063
Jean-Philippe Santini 204005

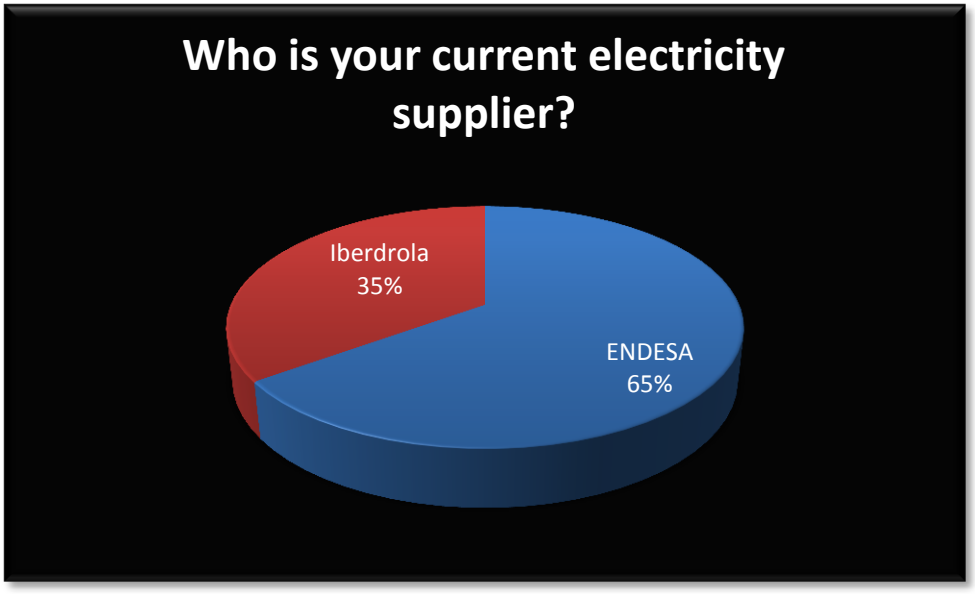
RESULTS OF THE SPANISH QUESTIONNAIRE

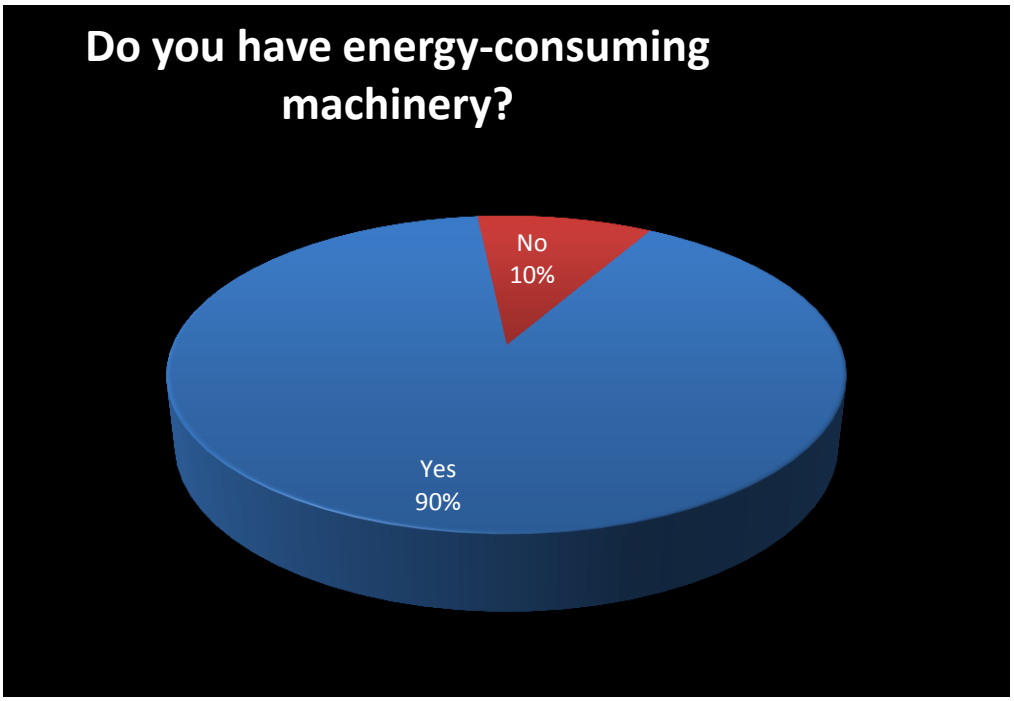
Who is your current electric supplier?	How many people work in the company (Already did some researches about that, but I haven't found all the information) or what is the size of your exploitation (for prima	Do you have energy-consuming machinery?	Of the following image parameters which do you consider most important for your company	What is your level of satisfaction in relation to your current electricity supplier?	Have you ever consider change your electric supplier?	Who would be involved in the decision?
Endesa	10	Yes	Price competitive	Moderately satisfied	Yes	Director
Endesa	13	Yes	Price competitive	More or less satisfied	Yes	Director
Endesa	220	Yes	Social responsibility	Moderately satisfied	No	Accounting service
endesa	150	Yes	Price competitive	More or less satisfied	No	Director
ENDESA	800	Yes	Price competitive	More or less satisfied	No	Purchasing department
Iberdrola	22	Yes	Price competitive	More or less satisfied	No	Board
Endesa	52	Yes	Price competitive	More or less satisfied	Yes	Purchasing department
ENDESA	64	Yes	Price competitive	Moderately satisfied	Yes	Accounting service

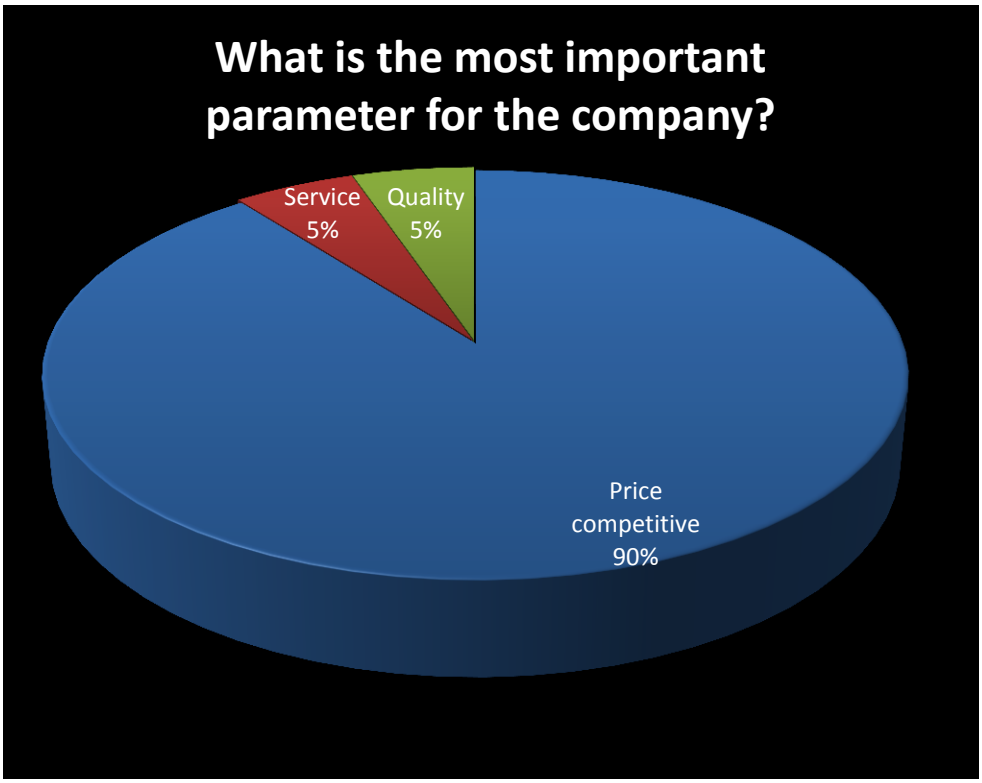
Why?	Where would you look for information about electric competitor offers?2	If your company has a special policy or communication strategy for the ecologic matters?	Do you know that some electric providers propose electric which is 100% from renewable energies such as Wind, Wave or solar?	Where did you find that information?	What are your motivations to change suppliers to consume 100% green electricity?	What would be the price increasing that you would be willing to accept to consume 100% environmentally friendly electricity?
High price	Internet	No	No		Price	5%
High price	Internet	No	No		Price	15%
	Internet	Yes	No	Internet	Price	20%
	Independent consultant	Yes	Yes	Internet	Price	30%
	Independent consultant	Yes	No		Price	
	Independent consultant	No	No		Price	5%
Price	Independent consultant	No	No		Price	5%
Improve conditions	Internet	Si	Yes	Internet	Price	

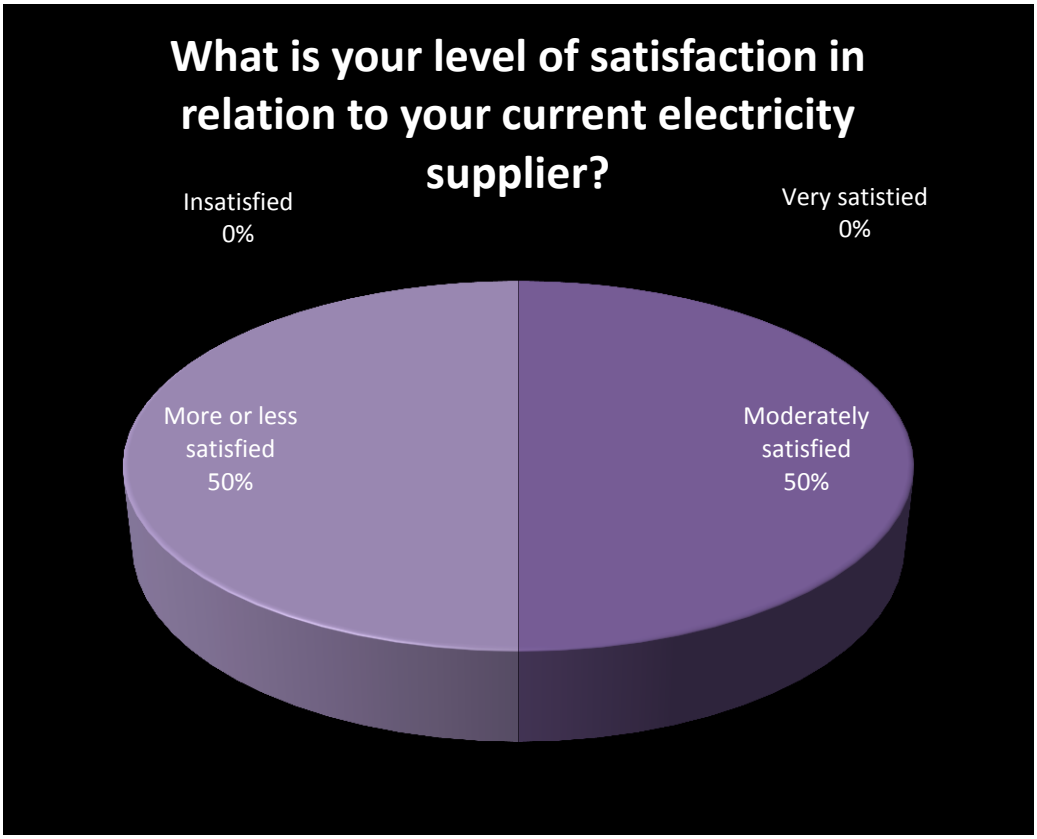
Patricia Zurano-Perez 206113
Irene Salinas 203955
Agustin Mesa Lombardo 206063
Jean-Philippe Santini 204005

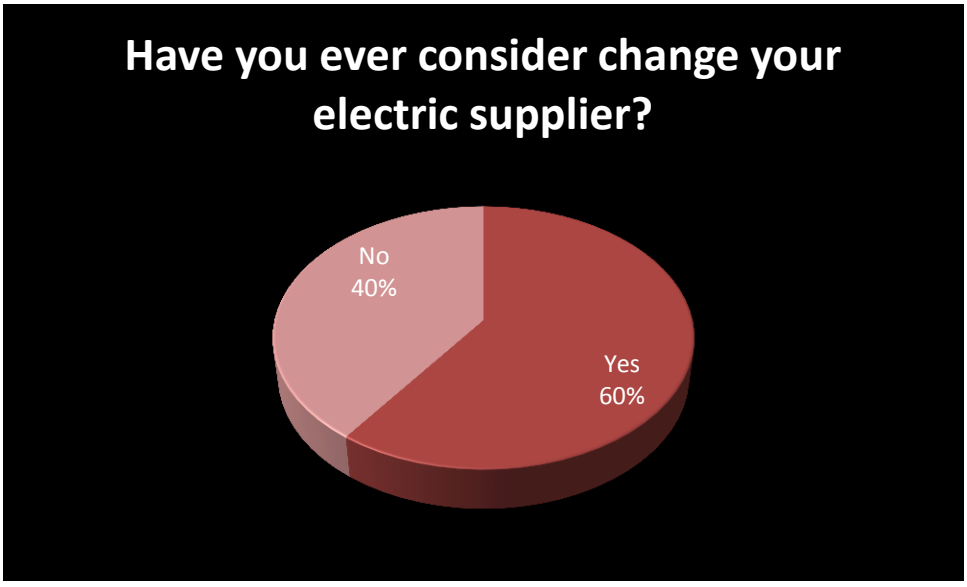
ANALYSIS OF THE SPANISH RESTULTS

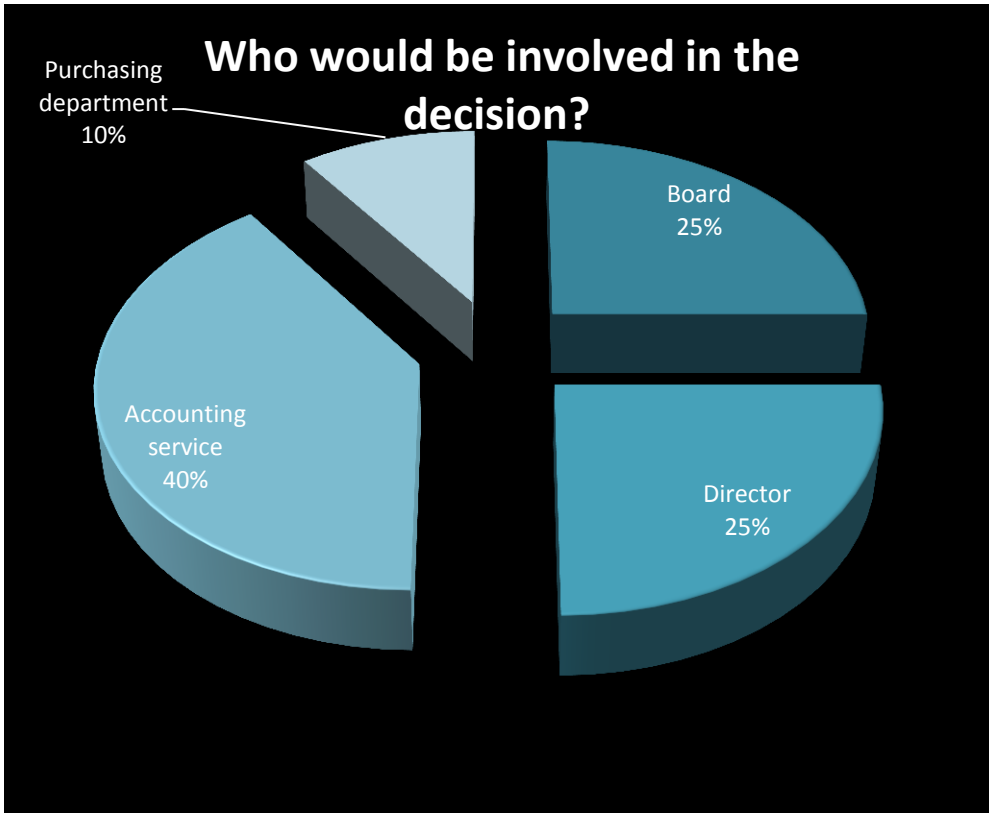


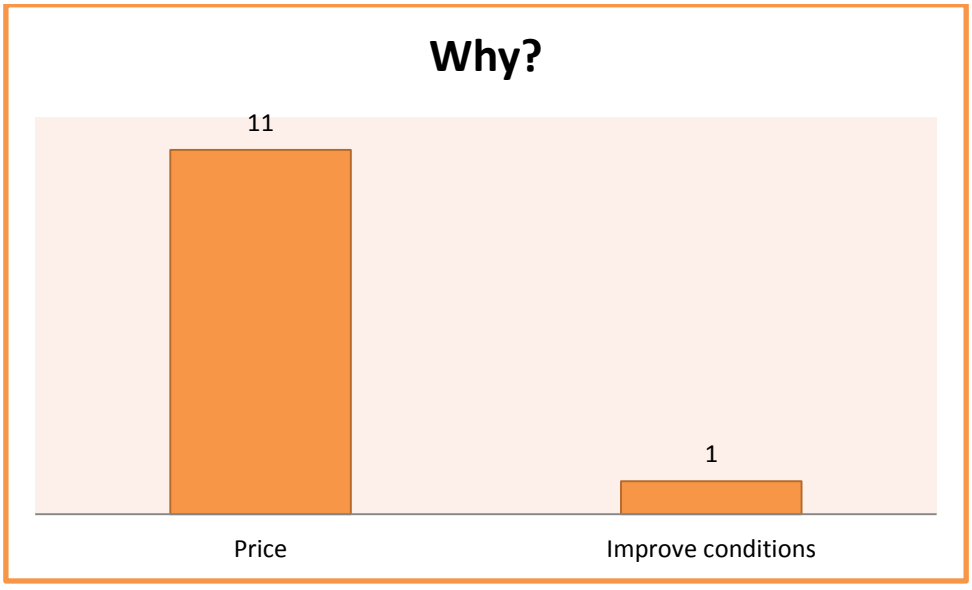


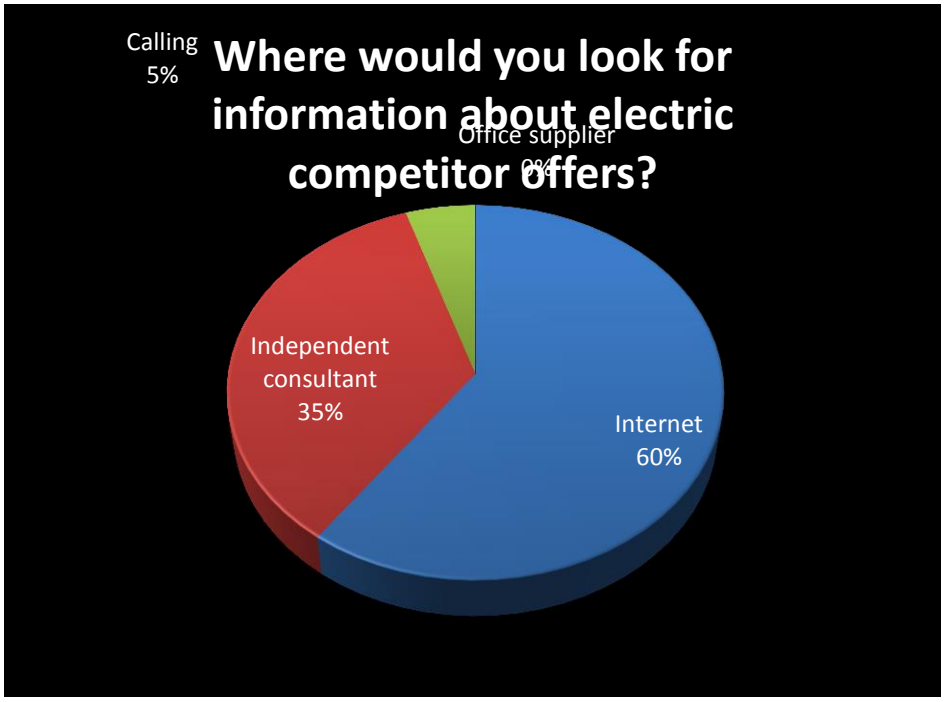

What is the most important parameter for the company?
Service 5%
Quality 5%
Price competitive 90%

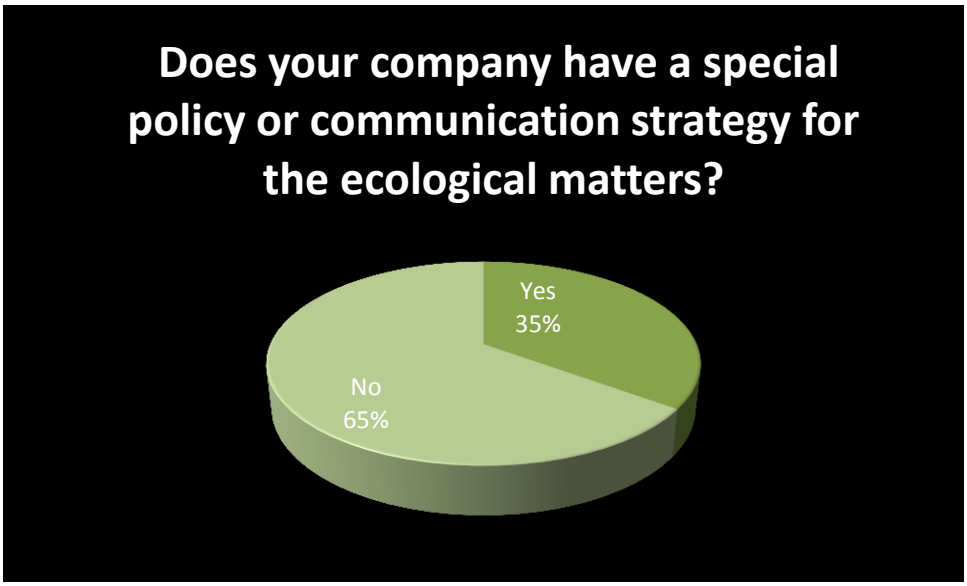

What is your level of satisfaction in relation to your current electricity supplier?
Insatisfied 0%
Very satistied 0%
More or less satisfied 50%
Moderately satisfied 50%

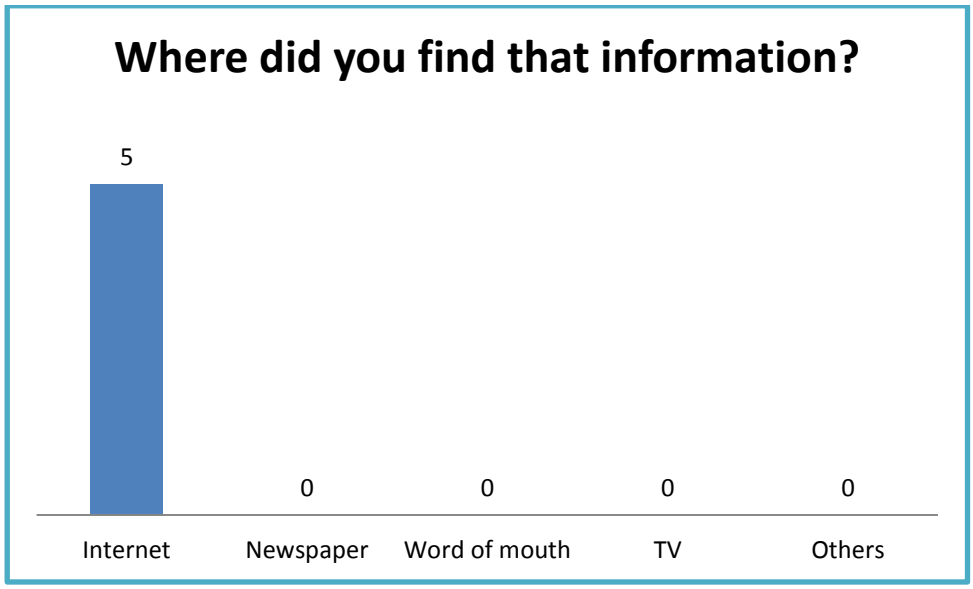

Have you ever consider change your electric supplier?
No 40%
Yes 60%

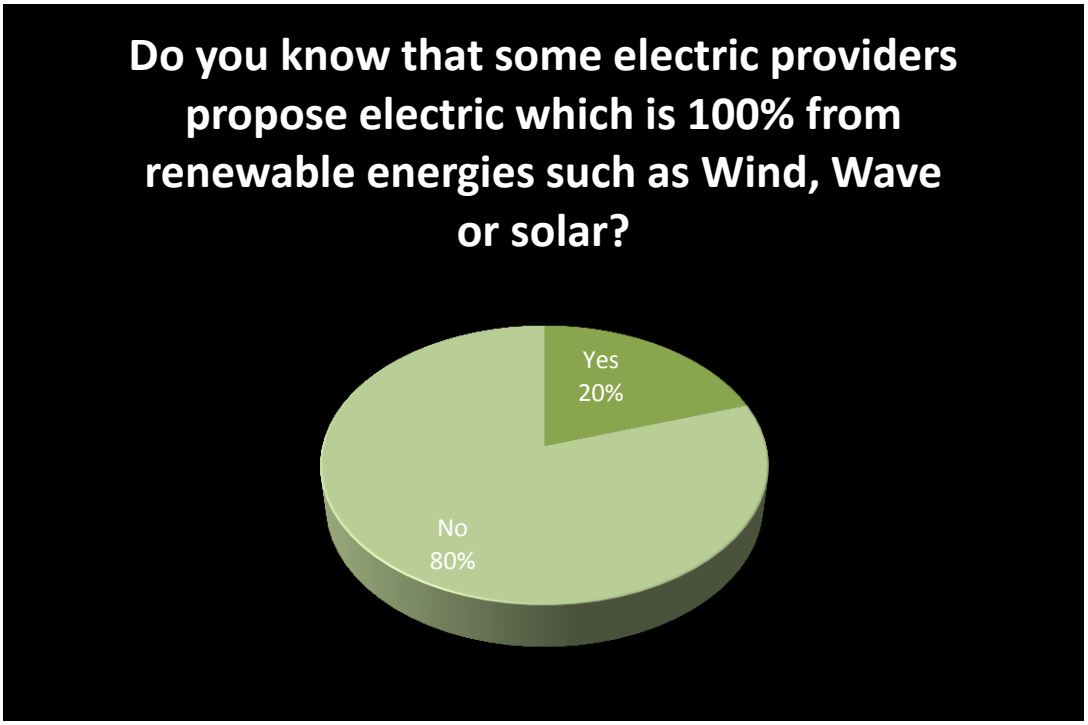

Who would be involved in the decision?
Purchasing department 10%
Board 25%
Director 25%
Accounting service 40%

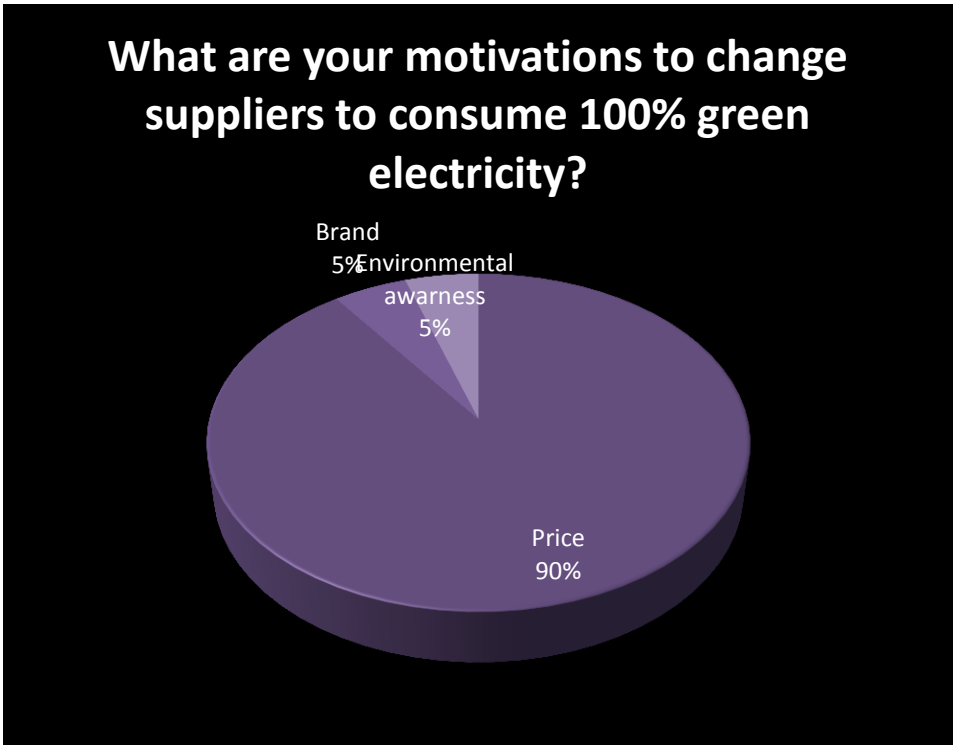

Why?
11
1
Price
Improve conditions

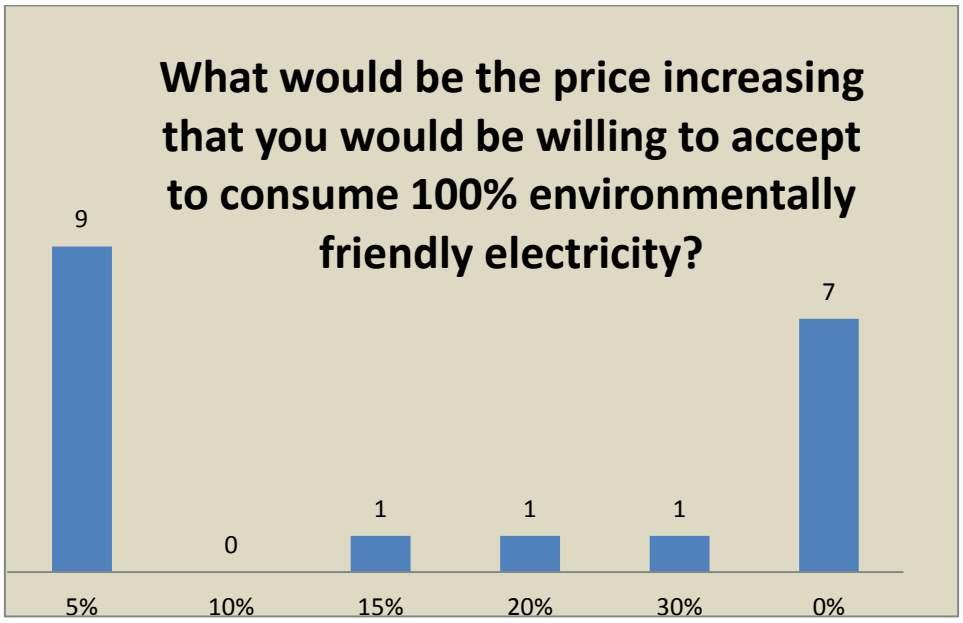

Where would you look for information about electric competitor offers?
Calling 5%
Office supplier 0%
Independent consultant 35%
Internet 60%


Does your company have a special policy or communication strategy for the ecological matters?
Yes 35%
No 65%


Where did you find that information?
5
0
0
0
0
Internet
Newspaper
Word of mouth
TV
Others


Do you know that some electric providers propose electric which is 100% from renewable energies such as Wind, Wave or solar?
Yes
20%
No
80%


What are your motivations to change suppliers to consume 100% green electricity?
Brand 5%
Environmental awarness 5%
Price 90%


What would be the price increasing that you would be willing to accept to consume 100% environmentally friendly electricity?
9
0
1
1
1
7
5%
10%
15%
20%
30%
0%

Patricia Zurano-Perez 206113
Irene Salinas 203955
Agustin Mesa Lombardo 206063
Jean-Philippe Santini 204005

FINANCE

YEAR 1

515000	agriculture companies					Ton Oil Equivalent in million	Gwh	8024,7	Production per companies in Mwh	Production per companies in Gwh	0,015581942	Target of Customer (objectif of Two 4 years)	
Average consumption of Agriculture and Agro-alimentary companies in France in 2012						0,69			15,58				
1 TOE	11,63Mwh	1 million TOE	11630	Gwh								Total production	79050
		1000 tep	11,63	Gwh			total production			79,05		Target Consumption / year	15,58
								79050,35481				Target Consumption /months	1,298333333
			Wind	Wave			Mwh		Gwh			Limit of production /month	6587,50
			25462,11827	444								Customer per month	5074
			76386,35481	2664		8024,7						Sales objective in 48 months	106

Sales Of Electricity

	January	Ferbuary	March	April	May	June	July	August	September	October	November	December	
New clients	0	106	106	106	106	106	106	106	106	106	106	106	1166
Turnover	January	Fervuary	March	April	May	June	July	August	September	October	November	December	Total clients
Customer	0	106	212	318	424	530	636	742	848	954	1060	1166	1166
Prices / Mwh	0	140,00 €	140,00 €	140,00 €	140,00 €	140,00 €	140,00 €	140,00 €	140,00 €	140,00 €	140,00 €	140,00 €	Total electricity sold to customer in Mwh
Consumption /mWh	0	137,62	275,25	412,87	550,49	688,12	825,74	963,36	1100,99	1 239	1376,23	1513,86	9083,14
Electric Sales	0	19 267,27 €	38 534,53 €	57 801,80 €	77 069,07 €	96 336,33 €	115 603,60 €	134 870,87 €	154 138,13 €	173 405,40 €	192 672,67 €	211 939,93 €	1 271 639,60 €
Annual Subscription	0	95 400,00 €	95 400,00 €	95 400,00 €	95 400,00 €	95 400,00 €	95 400,00 €	95 400,00 €	95 400,00 €	95 400,00 €	95 400,00 €	95 400,00 €	1 049 400,00 €
Turnover		114 667,27 €	133 934,53 €	153 201,80 €	172 469,07 €	191 736,33 €	211 003,60 €	230 270,87 €	249 538,13 €	268 805,40 €	288 072,67 €	307 339,93 €	2 321 039,60 €

	Price	Expectations or Objectives	Turnover			
Additionals Services	1250 / employees	150 employees formed	187 500,00 €			
Eco-Environmental formation		5/year	400 000,00 €	Charges 30%	993 000,00 €	695 100,00 €
Energetic Diagnosis		30 contract /years	240 000 €		297 900,00 €	
Assistance EMAS	40 000,00 €	20% of the Services turnover	165 500 €			
Ecologic Communication Plan	8 000 €					

Sales on EPEX SPOT

EPEX SPOT	January	Ferbuary	March	April	May	June	July	August	September	October	November	December	Total electricity sold in EPEX SPOT in Mwh
Mwh	5717,83	5717,83	5717,83	5717,83	5717,83	5717,83	5717,83	5717,83	5717,83	5717,83	5717,83	5717,83	68613,96
Price	46,94 €	46,94 €	46,94 €	46,94 €	46,94 €	46,94 €	46,94 €	46,94 €	46,94 €	46,94 €	46,94 €	46,94 €	
Sales on EPEX SPOT	268 394,94 €	268 394,94 €	268 394,94 €	268 394,94 €	268 394,94 €	268 394,94 €	268 394,94 €	268 394,94 €	268 394,94 €	268 394,94 €	268 394,94 €	268 394,94 €	3 220 739,28 €
Total Turnover	268 394,94 €	383 062,21 €	402 329,47 €	421 596,74 €	440 864,01 €	460 131,27 €	479 398,54 €	498 665,81 €	517 933,07 €	537 200,34 €	556 467,61 €	575 734,87 €	6 534 778,88 €

Charges

	January	Ferbuary	March	April	May	June	July	August	September	October	November	December	
Operating Charges	214 715,95 €	230 129,77 €	245 543,58 €	260 957,39 €	276 371,21 €	291 785,02 €	307 198,83 €	322 612,65 €	338 026,46 €	353 440,27 €	368 854,09 €	384 267,90 €	4 989 769,00 €
Investment Charges	45 627,14 €	65 120,58 €	68 396,01 €	71 671,45 €	74 946,88 €	78 222,32 €	81 497,75 €	84 773,19 €	88 048,62 €	91 324,06 €	94 599,49 €	97 874,93 €	942 102,41 €
Total Charges	260 343,09 €	295 250,34 €	313 939,59 €	332 628,84 €	351 318,09 €	370 007,34 €	388 696,58 €	407 385,83 €	426 075,08 €	444 764,33 €	463 453,58 €	482 142,83 €	

Sales Strategy Costs

	January	Ferbuary	March	April	May	June	July	August	September	October	November	December	
Agents	28 859,99 €	28 859,99 €	28 859,99 €	28 859,99 €	28 859,99 €	28 859,99 €	28 859,99 €	28 859,99 €	28 859,99 €	28 859,99 €	28 859,99 €	28 859,99 €	346 319,88 €
Phoning	440,00 €	440,00 €	440,00 €	440,00 €	440,00 €	440,00 €	440,00 €	440,00 €	440,00 €	440,00 €	440,00 €	440,00 €	5 280,00 €
Price comparator	0	0	0	0	0	0	0	0	0	0	0	-	- €
E commerce	3 000,00 €	3 000,00 €	3 000,00 €	3 000,00 €	3 000,00 €	3 000,00 €	3 000,00 €	3 000,00 €	3 000,00 €	3 000,00 €	3 000,00 €	3 000,00 €	36 000,00 €
													387 599,88 €

	Sales of electricity to customer	% of increase	Sales on EPEX Spot	% of deacrease	Sales of services	Annual Subscription	% of increase	Total turnover / year		Total Charges	6 319 471,29 €
Year 1	1 271 639,60 €	198,54%	3 220 739,28 €	-33,33%	993 000,00 €	1 049 400,00 €	100%	6 534 778,88 €	Earnings		215 307,59 €
Year 2	3 949 789,67 €	100%	2 439 565,68 €	-50%	993 000,00 €	2 194 200,00 €	53,60%	9 576 555,35 €			

Patricia Zurano-Perez 206113
Irene Salinas 203955
Agustin Mesa Lombardo 206063
Jean-Philippe Santini 204005

YEAR 2

	25462,11827	183.9		77525,75481	77,525						http://alpestat.com/lexique/html/_tep.html		
	76386,35481	1139,4		Mwh	Gwh								
515000	agriculture companies				Ton Oil Equivalent in million		Gwh	Production per companies in Gwh		Production per companies in Mwh			
Average consumption of Agriculture and Agro-alimentary companies in France in 2012					0,69		8024,7	0,015581942		15,58		rget of Customer (objectif of Two 4 yea	
1 TOE	11,63Mwh	1 million TOE	11630	Gwh								Total production	79050
		1000 tep	11,63	Gwh								Consumption	15,58
												Consumption /mon	1,298333333
												Limit of production	6587,50
												Customer per mont	5074
												Sales objective in 4	106

Sales Of Electricity

	January	Ferbuary	March	April	May	June	July	August	September	October	November	December	
Agriculture	1166	1272	1378	1484	1590	1696	1802	1908	2014	2120	2226	2332	

Turnover	January	Fervuary	March	April	May	June	July	August	September	October	November	December	
Customer	1272	1378	1484	1590	1696	1802	1908	2014	2120	2226	2332	2438	2438
Prices / Mwh	140,00 €	140,00 €	140,00 €	140,00 €	140,00 €	140,00 €	140,00 €	140,00 €	140,00 €	140,00 €	140,00 €	140,00 €	Total supply in Mwh
Consumption /mWh	1651,48	1651,48	1789,10	1926,726666	2064,35	2201,97	2477,22	2614,84	2752,47	2890,09	3027,71	3165,34	28212,78
Electricity Sales	231 207,20 €	231 207,20 €	250 474,47 €	269 741,73 €	289 009,00 €	308 276,27 €	346 810,80 €	366 078,07 €	385 345,33 €	404 612,60 €	423 879,87 €	443 147,13 €	3 949 789,67 €
Annual Subscription	1 144 800,00 €	95 400,00 €	95 400,00 €	95 400,00 €	95 400,00 €	95 400,00 €	95 400,00 €	95 400,00 €	95 400,00 €	95 400,00 €	95 400,00 €	95 400,00 €	2 194 200,00 €
Turnover	1 376 007,20 €	326 607,20 €	345 874,47 €	365 141,73 €	384 409,00 €	403 676,27 €	442 210,80 €	461 478,07 €	480 745,33 €	500 012,60 €	519 279,87 €	538 547,13 €	6 143 989,67 €

Additionals Services	Price	Expectations or Objectives	Turnover			
Eco-Environmental for	1250 / employe	150 employees formed	187 500,00 €			
Energetic Diagnosis	40 000,00 €	5/year	400 000,00 €	Charges 30%	993 000,00 €	695 100,00 €
Assistance EMAS	8 000 €	30 contract /years	240 000 €		297 900,00 €	
Ecologic Communicat	Customized	20% of the Services turnover	165 500 €			

Sales on EPEX SPOT

EPEX SPOT	January	Ferbuary	March	April	May	June	July	August	September	October	November	December	total supply in Mwh
Mwh	4331	4331	4331	4331	4331	4331	4331	4331	4331	4331	4331	4331	51972
Price	46,94 €	46,94 €	46,94 €	46,94 €	46,94 €	46,94 €	46,94 €	46,94 €	46,94 €	46,94 €	46,94 €	46,94 €	
Turnover	203 297,14 €	203 297,14 €	203 297,14 €	203 297,14 €	203 297,14 €	203 297,14 €	203 297,14 €	203 297,14 €	203 297,14 €	203 297,14 €	203 297,14 €	203 297,14 €	2 439 565,68 €
Total Turnover	1 579 304,34 €	529 904,34 €	549 171,61 €	568 438,87 €	587 706,14 €	606 973,41 €	645 507,94 €	664 775,21 €	684 042,47 €	703 309,74 €	722 577,01 €	741 844,27 €	9 278 655,35 €

Charges

Operating Charges	1 263 443,47 €	423 923,47 €	439 337,29 €	454 751,10 €	470 164,91 €	485 578,73 €	516 406,35 €	531 820,17 €	547 233,98 €	562 647,79 €	578 061,61 €	593 475,42 €	6 866 844,28 €
Investment Charges	268 481,74 €	90 083,74 €	93 359,17 €	96 634,61 €	99 910,04 €	103 185,48 €	109 736,35 €	113 011,79 €	116 287,22 €	119 562,66 €	122 838,09 €	126 113,53 €	1 459 204,41 €

Sales Strategy Costs

	January	Ferbuary	March	April	May	June	July	August	September	October	November	December	
Agents	28 859,99 €	28 859,99 €	28 859,99 €	28 859,99 €	28 859,99 €	28 859,99 €	28 859,99 €	28 859,99 €	28 859,99 €	28 859,99 €	28 859,99 €	28 859,99 €	346 319,88 €
Phoning	440,00 €	440,00 €	440,00 €	440,00 €	440,00 €	440,00 €	440,00 €	440,00 €	440,00 €	440,00 €	440,00 €	440,00 €	5 280,00 €
Price comparator	0	0	0	0	0	0	0	0	0	0	0	0	- €
E commerce	3 000,00 €	3 000,00 €	3 000,00 €	3 000,00 €	3 000,00 €	3 000,00 €	3 000,00 €	3 000,00 €	3 000,00 €	3 000,00 €	3 000,00 €	3 000,00 €	36 000,00 €
													387 599,88 €
												Total Charges	8 713 648,57 €
												Earnings	565 006,78 €

Patricia Zurano-Perez 206113
Irene Salinas 203955
Agustin Mesa Lombardo 206063
Jean-Philippe Santini 204005

YEAR 3

	25462,11827	444		77525,75481	77,525						http://alpestat.com/lexique/html/_tep.html		
	76386,35481	2664		Mwh	Gwh								
515000	agriculture companies				Ton Oil Equivalent in million		Gwh	Production per companies in Gwh		Production per companies in Mwh			
Average consumption of Agriculture and Agro-alimentary companies in France in 2012					0,69		8024,7	0,015581942		15,58		arget of Customer (objectif of Two 4 years	
1 TOE	11,63Mwh	1 million TOE	11630	Gwh								Total production	79050
		1000 tep	11,63	Gwh								Consumption	15,58
												Consumption /mo	1,298333333
												Limit of productio	6587,50
												Customer per mo	5074
												Sales objective in	106

Sales Of Electricity

	January	Ferbuary	March	April	May	June	July	August	September	October	November	December	
Agriculture	2416	2522	2628	2734	2840	2946	3052	3158	3264	3370	3476	3582	
Turnover	January	Fervuary	March	April	May	June	July	August	September	October	November	December	
Customer	2544	2650	2756	2862	2968	3074	3180	3286	3392	3498	3604	3710	3710
Prices / Mwh	140,00 €	140,00 €	140,00 €	140,00 €	140,00 €	140,00 €	140,00 €	140,00 €	140,00 €	140,00 €	140,00 €	140,00 €	Total supply in Mwh
Consumptio	3302,96	3440,58	3578,21	3715,83	3853,45	3991,08	4128,70	4266,32	4403,95	4541,57	4679,19	4816,82	48718,66
Annual Subs	2 289 600,00 €	95 400,00 €	95 400,00 €	95 400,00 €	95 400,00 €	95 400,00 €	95 400,00 €	95 400,00 €	95 400,00 €	95 400,00 €	95 400,00 €	95 400,00 €	3 339 000,00 €
Electric sales	462 414,40 €	481 681,67 €	500 948,93 €	520 216,20 €	539 483,47 €	558 750,73 €	578 018,00 €	597 285,27 €	616 552,53 €	635 819,80 €	655 087,07 €	674 354,33 €	6 820 612,40 €
Turnover	2 752 014,40 €	577 081,67 €	596 348,93 €	615 616,20 €	634 883,47 €	654 150,73 €	673 418,00 €	692 685,27 €	711 952,53 €	731 219,80 €	750 487,07 €	769 754,33 €	10 159 612,40 €

Additionals Servic	Price	Expectations or Objectives	Turnover			
Eco-Environmenta	1250 / employe	150 employees formed	187 500,00 €			
Energetic Diagnos	40 000,00 €	5/year	400 000,00 €	Charges 30%	993 000,00 €	695 100,00 €
Assistance EMAS	8 000 €	30 contract /years	240 000 €		297 900,00 €	
Ecologic Commur	Customized	20% of the Services turnover	165 500 €			

Sales on EPEX SPOT

EPEX SPOT	January	Ferbuary	March	April	May	June	July	August	September	October	November	December	total supply in Mwh
Mwh	2708,08	2708,08	2708,08	2708,08	2708,08	2708,08	2708,08	2708,08	2708,08	2708,08	2708,08	2708,08	32496,96
Price	46,94 €	46,94 €	46,94 €	46,94 €	46,94 €	46,94 €	46,94 €	46,94 €	46,94 €	46,94 €	46,94 €	46,94 €	
Turnover	127 117,28 €	127 117,28 €	127 117,28 €	127 117,28 €	127 117,28 €	127 117,28 €	127 117,28 €	127 117,28 €	127 117,28 €	127 117,28 €	127 117,28 €	127 117,28 €	1 525 407,30 €
Total Turnov	2 879 131,68 €	704 198,94 €	723 466,21 €	742 733,48 €	762 000,74 €	781 268,01 €	800 535,28 €	819 802,54 €	839 069,81 €	858 337,08 €	877 604,34 €	896 871,61 €	12 380 119,70 €

Charges

Operating Ch	2 303 305,34 €	563 359,15 €	578 772,97 €	594 186,78 €	609 600,59 €	625 014,41 €	640 428,22 €	655 842,03 €	671 255,85 €	686 669,66 €	702 083,47 €	717 497,29 €	9 348 015,76 €
Investment (	489 452,38 €	119 713,82 €	122 989,26 €	126 264,69 €	129 540,13 €	132 815,56 €	136 091,00 €	139 366,43 €	142 641,87 €	145 917,30 €	149 192,74 €	152 468,17 €	1 986 453,35 €

Sales Strategy Costs

	January	Ferbuary	March	April	May	June	July	August	September	October	November	December	
Agents	28 859,99 €	28 859,99 €	28 859,99 €	28 859,99 €	28 859,99 €	28 859,99 €	28 859,99 €	28 859,99 €	28 859,99 €	28 859,99 €	28 859,99 €	28 859,99 €	346 319,88 €
Phoning	440,00 €	440,00 €	440,00 €	440,00 €	440,00 €	440,00 €	440,00 €	440,00 €	440,00 €	440,00 €	440,00 €	440,00 €	5 280,00 €
Price compa	0	0	0	0	0	0	0	0	0	0	0	0	- €
E commerce	3 000,00 €	3 000,00 €	3 000,00 €	3 000,00 €	3 000,00 €	3 000,00 €	3 000,00 €	3 000,00 €	3 000,00 €	3 000,00 €	3 000,00 €	3 000,00 €	36 000,00 €
													387 599,88 €
												Toral charges	11 722 068,99 €
												Earnings	658 050,71 €

Patricia Zurano-Perez 206113
Irene Salinas 203955
Agustin Mesa Lombardo 206063
Jean-Philippe Santini 204005

YEAR 4

	Wind	Wave		total production		
	25462,11827	444		79050,35481	79,05	http://agreste.agriculture.gouv.fr/IMG/pdf_primeur278.pdf
	76386,35481	2664		Mwh	Gwh	http://alpestat.com/lexique/html/_tep.html

515000 agriculture companies	Ton Oil Equivalent in million	Gwh	Production per companies in Gwh	Production per companies in Mwh	
Average consumption of Agriculture and Agro-alimentary companies in France in 2012	0,69	8024,7	0,015581942	15,58	arget of Customer (objectif of Two 4 years

1 TOE	11,63Mwh	1 million TOE	11630	Gwh
		1000 tep	11,63	Gwh

Total production	79050
Consumption	15,58
Consumption /mo	1,298333333
Limit of productio	6587,50
Customer per mo	5074
Sales objective in	106

Sales Of Electricity

	January	Ferbuary	March	April	May	June	July	August	September	October	November	December	
Agriculture	3688	3794	3900	4006	4112	4218	4324	4430	4536	4642	4748	4854	

Turnover	January	Fervuary	March	April	May	June	July	August	September	October	November	December	
Customer	3816	3922	4028	4134	4240	4346	4452	4558	4664	4770	4876	4982	4982
Prices / Mwh	140,00 €	140,00 €	140,00 €	140,00 €	140,00 €	140,00 €	140,00 €	140,00 €	140,00 €	140,00 €	140,00 €	140,00 €	Total supply in Mwh
Consumption /mWh	4954,44	5092,06	5229,69	5367,309999	5504,93	5642,56	5780,18	5917,80	6055,43	6193,05	6330,67	6468,30	68536,42
Electricity Sales	693 621,60 €	712 888,87 €	732 156,13 €	751 423,40 €	770 690,67 €	789 957,93 €	809 225,20 €	828 492,47 €	847 759,73 €	867 027,00 €	886 294,27 €	905 561,53 €	9 595 098,80 €
Annual Subscription	3 434 400,00 €	95 400,00 €	95 400,00 €	95 400,00 €	95 400,00 €	95 400,00 €	95 400,00 €	95 400,00 €	95 400,00 €	95 400,00 €	95 400,00 €	95 400,00 €	4 483 800,00 €
Turnover	4 128 021,60 €	808 288,87 €	827 556,13 €	846 823,40 €	866 090,67 €	885 357,93 €	904 625,20 €	923 892,47 €	943 159,73 €	962 427,00 €	981 694,27 €	1 000 961,53 €	14 078 898,80 €

Additionals Service	Price	Expectations or Objectives	Turnover			
Eco-Environmental	1250 / employees	150 employees formed	187 500,00 €			
Energetic Diagnosis	40 000,00 €	5/year	400 000,00 €	Charges 30%	993 000,00 €	695 100,00 €
Assistance EMAS	8 000 €	30 contract /years	240 000 €		297 900,00 €	
Ecologic Communi	Customized	20% of the Services turnover	165 500 €			

Sales on EPEX SPOT

EPEX SPOT	January	Ferbuary	March	April	May	June	July	August	September	October	November	December	total supply in Mwh
Mwh	1222,79	1222,79	1222,79	1222,79	1222,79	1222,79	1222,79	1222,79	1222,79	1222,79	1222,79	1222,79	14673,48
Price	46,94 €	46,94 €	46,94 €	46,94 €	46,94 €	46,94 €	46,94 €	46,94 €	46,94 €	46,94 €	46,94 €	46,94 €	
Turnover	57 397,76 €	57 397,76 €	57 397,76 €	57 397,76 €	57 397,76 €	57 397,76 €	57 397,76 €	57 397,76 €	57 397,76 €	57 397,76 €	57 397,76 €	57 397,76 €	688 773,15 €
Total Turnover	4 185 419,36 €	865 686,63 €	884 953,90 €	904 221,16 €	923 488,43 €	942 755,70 €	962 022,96 €	981 290,23 €	1 000 557,50 €	1 019 824,76 €	1 039 092,03 €	1 058 359,30 €	15 462 771,95 €

Charges

Operating Charges	3 348 335,49 €	692 549,30 €	707 963,12 €	723 376,93 €	738 790,74 €	754 204,56 €	769 618,37 €	785 032,18 €	800 446,00 €	815 859,81 €	831 273,62 €	846 687,44 €	11 814 137,56 €
Investment Charges	711 521,29 €	147 166,73 €	150 442,16 €	153 717,60 €	156 993,03 €	160 268,47 €	163 543,90 €	166 819,34 €	170 094,77 €	173 370,21 €	176 645,64 €	179 921,08 €	2 510 504,23 €

Sales Strategy Costs

	January	Ferbuary	March	April	May	June	July	August	September	October	November	December	
Agents	28 859,99 €	28 859,99 €	28 859,99 €	28 859,99 €	28 859,99 €	28 859,99 €	28 859,99 €	28 859,99 €	28 859,99 €	28 859,99 €	28 859,99 €	28 859,99 €	346 319,88 €
Phoning	440,00 €	440,00 €	440,00 €	440,00 €	440,00 €	440,00 €	440,00 €	440,00 €	440,00 €	440,00 €	440,00 €	440,00 €	5 280,00 €
Price comparator	0	0	0	0	0	0	0	0	0	0	0	0	- €
E commerce	3 000,00 €	3 000,00 €	3 000,00 €	3 000,00 €	3 000,00 €	3 000,00 €	3 000,00 €	3 000,00 €	3 000,00 €	3 000,00 €	3 000,00 €	3 000,00 €	36 000,00 €
													387 599,88 €
												Total Charges	14 712 241,67 €
												Earnings	750 530,28 €

Patricia Zurano-Perez 206113
Irene Salinas 203955
Agustin Mesa Lombardo 206063
Jean-Philippe Santini 204005

YEAR 5

http://agreste.agriculture.gouv.fr/IMG/pdf_primeur278.pdf
http://alpestat.com/lexique/html/_tep.html

	Wind	Wave	total production		
	25462,11827	444	79050,35481		79,05
	76386,35481	2664	Mwh	Gwh	

515000	agriculture companies				Ton Oil Equivalent in million		Gwh	Production per companies in Gwh	Production per companies in Mwh					
Average consumption of Agriculture and Agro-alimentary companies in France in 2012					0,69		8024,7	0,015581942	15,58					
1 TOE	11,63Mwh	1 million TOE		11630	Gwh									
		1000 tep		11,63	Gwh									

	January	Ferbuary	March	April	May	June	July	August	September	October	November	December	
Agriculture	5074	5074	5074	5074	5074	5074	5074	5074	5074	5074	5074	5074	
Turnover	January	Fervuary	March	April	May	June	July	August	September	October	November	December	
Customer	5074	5074	5074	5074	5074	5074	5074	5074	5074	5074	5074	5074	
Prices / Mwh	140,00 €	140,00 €	140,00 €	140,00 €	140,00 €	140,00 €	140,00 €	140,00 €	140,00 €	140,00 €	140,00 €	140,00 €	Total supply in Mwh
Consumption /mWh	6587,74	6587,74	6577,36	6577,36	6577,36	6577,36	6577,36	6577,36	6577,36	6577,36	6577,36	6577,36	78949,09
Electricity Sales	922 284,07 €	922 284,07 €	920 830,40 €	920 830,40 €	920 830,40 €	920 830,40 €	920 830,40 €	920 830,40 €	920 830,40 €	920 830,40 €	920 830,40 €	920 830,40 €	11 052 872,13 €
Annual Subscription	4 566 600,00 €	95 400,00 €											4 662 000,00 €
Turnover	5 488 884,07 €	1 017 684,07 €	920 830,40 €	920 830,40 €	920 830,40 €	920 830,40 €	920 830,40 €	920 830,40 €	920 830,40 €	920 830,40 €	920 830,40 €	920 830,40 €	15 714 872,13 €

								Additionals Service	Price		Expectations or Objectives	Turnover		
								Eco-Environmental	1250 / employees		150 employees formed	187 500,00 €		
			0					Energetic Diagnosis	40 000,00 €		5/year	400 000,00 €	Charges 30%	695 100,00 €
								Assistance EMAS	8 000 €		30 contract /years	240 000 €	993 000,00 €	
								Ecologic Commun	Customized		20% of the Services turnover	165 500 €	297 900,00 €	

Charges

	January	Ferbuary	March	April	May	June	July	August	September	October	November	December	
Operating Charges	4 391 107,25 €	814 147,25 €	736 664,32 €	736 664,32 €	736 664,32 €	736 664,32 €	736 664,32 €	736 664,32 €	736 664,32 €	736 664,32 €	736 664,32 €	736 664,32 €	12 571 897,71 €
Investment Charges	933 110,29 €	173 006,29 €	156 541,17 €	156 541,17 €	156 541,17 €	156 541,17 €	156 541,17 €	156 541,17 €	156 541,17 €	156 541,17 €	156 541,17 €	156 541,17 €	2 671 528,26 €

													16 409 972,13 €	

Sales Strategy Costs

	January	Ferbuary	March	April	May	June	July	August	September	October	November	December	
Agents	28 859,99 €	24 825,00 €	24 825,00 €	24 825,00 €	24 825,00 €	24 825,00 €	24 825,00 €	24 825,00 €	24 825,00 €	24 825,00 €	24 825,00 €	24 825,00 €	301 934,99 €
Phoning	440,00 €												
Price comparator	0		0	0	0	0	0	0	0	0	0	0	- €
E commerce	3 000,00 €	3 000,00 €	3 000,00 €	3 000,00 €	3 000,00 €	3 000,00 €	3 000,00 €	3 000,00 €	3 000,00 €	3 000,00 €	3 000,00 €	3 000,00 €	36 000,00 €
													337 934,99 €

Total Charges	15 581 360,96 €
Earnings	828 611,17 €

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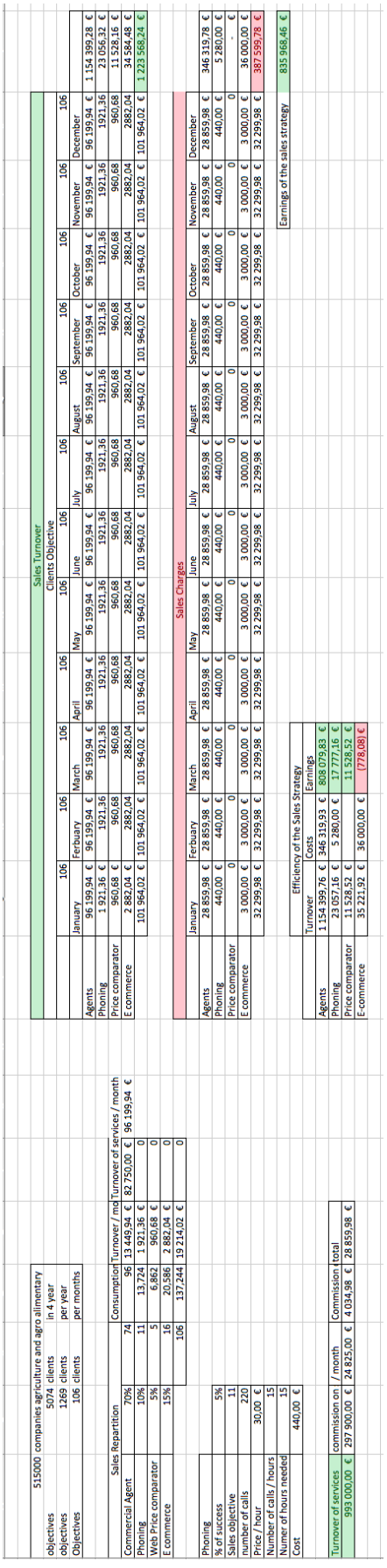
SALES STRATEGY



515000	companies agriculture and agro alimentary		
objectives	5074	clients	in 4 year
objectives	1269	clients	per year
Objectives	106	clients	per months

Sales Repartition		Consumption	Turnover / month	Turnover of services / month
Commercial Agent	70%	74	13 449,94 €	82 750,00 € 0
Phoning	10%	11	13,724 1 921,36 €	0
Web Price comparator	5%	5	6,862 960,68 €	0
E commerce	15%	16	20,586 2 882,04 €	0
		106	137,244 19 214,02 €	0

Phoning														
% of success	5%													
Sales objective	11													
number of calls	220													
Price / hour	30,00 €													
Number of calls / hours	15													
Numer of hours needed	15													
Cost	440,00 €													

Turnover of services	commission on	/ month	Commission total
993 000,00 €	297 900,00 €	24 825,00 €	4 034,98 € 28 859,98 €

Sales Turnover

Clients Objective 106 106 106 106 106 106 106 106 106 106 106 106

	January	Febuary	March	April	May	June	July	August	September	October	November	December	
Agents	96 199,94 €	96 199,94 €	96 199,94 €	96 199,94 €	96 199,94 €	96 199,94 €	96 199,94 €	96 199,94 €	96 199,94 €	96 199,94 €	96 199,94 €	96 199,94 €	1 154 399,28 €
Phoning	1 921,36 €	1921,36	1921,36	1921,36	1921,36	1921,36	1921,36	1921,36	1921,36	1921,36	1921,36	1921,36	23 056,32 €
Price comparator	960,68 €	960,68	960,68	960,68	960,68	960,68	960,68	960,68	960,68	960,68	960,68	960,68	11 528,16 €
E commerce	2 882,04 €	2882,04	2882,04	2882,04	2882,04	2882,04	2882,04	2882,04	2882,04	2882,04	2882,04	2882,04	34 584,48 €
	101 964,02 €	101 964,02 €	101 964,02 €	101 964,02 €	101 964,02 €	101 964,02 €	101 964,02 €	101 964,02 €	101 964,02 €	101 964,02 €	101 964,02 €	101 964,02 €	1 223 568,24 €

Sales Charges

	January	Febuary	March	April	May	June	July	August	September	October	November	December	
Agents	28 859,98 €	28 859,98 €	28 859,98 €	28 859,98 €	28 859,98 €	28 859,98 €	28 859,98 €	28 859,98 €	28 859,98 €	28 859,98 €	28 859,98 €	28 859,98 €	346 319,78 €
Phoning	440,00 €	440,00 €	440,00 €	440,00 €	440,00 €	440,00 €	440,00 €	440,00 €	440,00 €	440,00 €	440,00 €	440,00 €	5 280,00 €
Price comparator	0	0	0	0	0	0	0	0	0	0	0	0	- €
E commerce	3 000,00 €	3 000,00 €	3 000,00 €	3 000,00 €	3 000,00 €	3 000,00 €	3 000,00 €	3 000,00 €	3 000,00 €	3 000,00 €	3 000,00 €	3 000,00 €	36 000,00 €
	32 299,98 €	32 299,98 €	32 299,98 €	32 299,98 €	32 299,98 €	32 299,98 €	32 299,98 €	32 299,98 €	32 299,98 €	32 299,98 €	32 299,98 €	32 299,98 €	387 599,78 €

Efficiency of the Sales Strategy

	Turnover	Costs	Earnings
Agents	1 154 399,76 €	346 319,93 €	808 079,83 €
Phoning	23 057,16 €	5 280,00 €	17 777,16 €
Price comparator	11 528,52 €		11 528,52 €
E-commerce	35 221,92 €	36 600,00 €	(778,08) €

Earnings of the sales strategy 835 968,46 €

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PROCESS REPORT. IRENE SALINAS PALLARÉS

First of all, I had some problems to find a group because of my home university but finally I found this group and I liked the idea that they were going to work on.

We formed the group in a meeting were some people exposed their ideas and as I knew Agustín before, I decide to enroll in this group.

We are four members in the group, two mechanics: Agustín and Patricia; and two GBEs: Jean Phillippe and me.

We decided that the mechanics were going to make the design and all the calculations of the platform and that the GBEs were going to find the way to sell the energy, but there were still many things to decide.

Then we had a meeting with each supervisor that helped us to start doing the project description and also the project itself. I'm a GBE student so the part of the project that I know more is the one related to GBE.

In the meeting with the supervisor we were measuring up whether to make a platform to sell or to sell only the energy, finally and after talking with the mechanics we decided to sell the energy as an electricity supplier.

Another important thing that we had to decided was where were we going to sell the energy and who were going to be our customers. At first we were going to sell the product in Denmark but we the supervisor told us that the information would be in Danish and that it will be difficult to contact companies, so as none of us knows Danish we had to find another place. Lastly we were deciding between France and Spain because Jean Phillippe and I are French and Spanish and we finally decided to sell the energy in the French market.

In my opinion working in groups has more advantages than disadvantages; since the beginning we have talked, discussed and finally decided all the important issues related to the project. I think it's good to work in groups because two minds think better than

one so it's easier to solve all the problems we find doing the project and besides, we learn to cooperate with others which is what we will probably do in our future jobs.

The disadvantages of working in groups appear if someone works less than others, but in our group I think we all have worked more or less the same, so I cannot find disadvantages of working in this group. The only disadvantage has been the lack of coordination between the mechanical and the business part.

At first we did a meeting with all the members of the group where we decided some important things that connected the GBE and mechanic and later I started to meet only with Jean Phillippe to do the GBE part. We met almost every week to put our parts in common, divide assignments and discuss the important issues.

In my opinion we all have done our best and shared our ideas for developing the project the best way we could and besides, we have used our previous skills to develop it.

My previous skills have been very important for doing the project and also the courses I'm following here. For example I've used the things I've learned in Marketing Management to do the marketing, selling and promotion part of the project. I've found really interesting to apply the things I've learned in a real project.

I find the energy market very challenger and I really like the theme but it is quite difficult to find all the information. There has been a hard researching work behind the project.

Working in multicultural groups is good to know other people and how people from other countries work. In this group I think more or less all had the same working habits.

The part of the project that I've done is the market analysis and also part of the business plan.

The creation of the problem formulation has helped us to know what we wanted to achieve during the project, and also how to do it. We have changed the project description during the developing of the project. The time schedule has been really useful and also the delimitation, to know what to do when we didn't know what to do.

I'm satisfied with the project result, we have followed what we decided at first in the project description and we have solved the problem. Moreover I'm satisfied because we have gone through all the problems we have found in the way and we have been able to finish the project in time.

We have met several times with our GBE supervisor and I'm really satisfied with his implication because he really gave us good feedbacks of our work and he also stayed in contact with us during all the project development.

As I've said before I think our planning was successful, we followed it the best we could.

To sum up I would like to explain that I'm happy with the way this group has worked and with all of my project mates job. I find working in multicultural groups very interesting to know other people, other ways of working and cooperating with people. I think we all have done our best and used our skills during the process so we have worked hard to make the project. And lastly, in my opinion working on real projects is very important for our future because we learn how to work with other people, improve our skills and also use what we have learned in class, either here in Via or in our host university.

Jean Philippe Process report

Concerning the group : The great advantage of our group in terms of expertise is that we are all interdependent, that is to say that everyone had these specific skills, allowing us to have a working group complete and versatile. The motivation of the group was great because all of us looked the project on which we have worked. Personally something that demotivated me early in the project when I was doing the questionnaire was the difficulty fat the begining to have response and also the misunderstanding with my interlocutors because i have a huge South France accent.

In a multicultural group like ours, everyone brings his way to do things, and i observed is very different between Spain and France, for countries which are geographically and culturally close. I've learned a lot in contact to the team. On the other hand as my colleagues have said levels of English were not the same and communication was sometimes difficult. I learned that group work and more importantly again in a multicultural group is not easy task. But it is a huge experiences gain at professional level for the future but also on a personal level because you learn to listen to ideas of other members and you have to convince your colleagues that your idea is good. Furthermore cooperation in the group has always been good and there has never been a conflict between us.

I'm satisfied by the work that we done because it is in line with my basic goal, which was to get an overview of the market and a MarketingPlan. I would have liked to make a real

and complete business model but we dind't have all the necessary skills specially in terms of finance.

Most of the supervisors have another job and that can influence his capacity of helping, but in our case our supervisor was very available to helping us. We were very lucky because we found a supervisor always available to help and listen to us; we could write him any time of the week and we know he will answer as fast as possible. Further from the point of view of organization of meetings, he was very flexible and tried all the time to adapt to our schedule. Our coordinator found out, at the beginning of the project, that we have started late because none of us found a project in the right time so we had to do other metting in order to find a project, and for my part i was a bit demotivated, but the tutor had this strenght to motivate you and push you to do the best of yourself and i only met few teacher like that in my life. To finish his advices were always very helpful and targeted, evidence that he understood our project and what we wanted really do.
To summarize, I would end up with the general advantages and disadvantages of the project :
Advantages

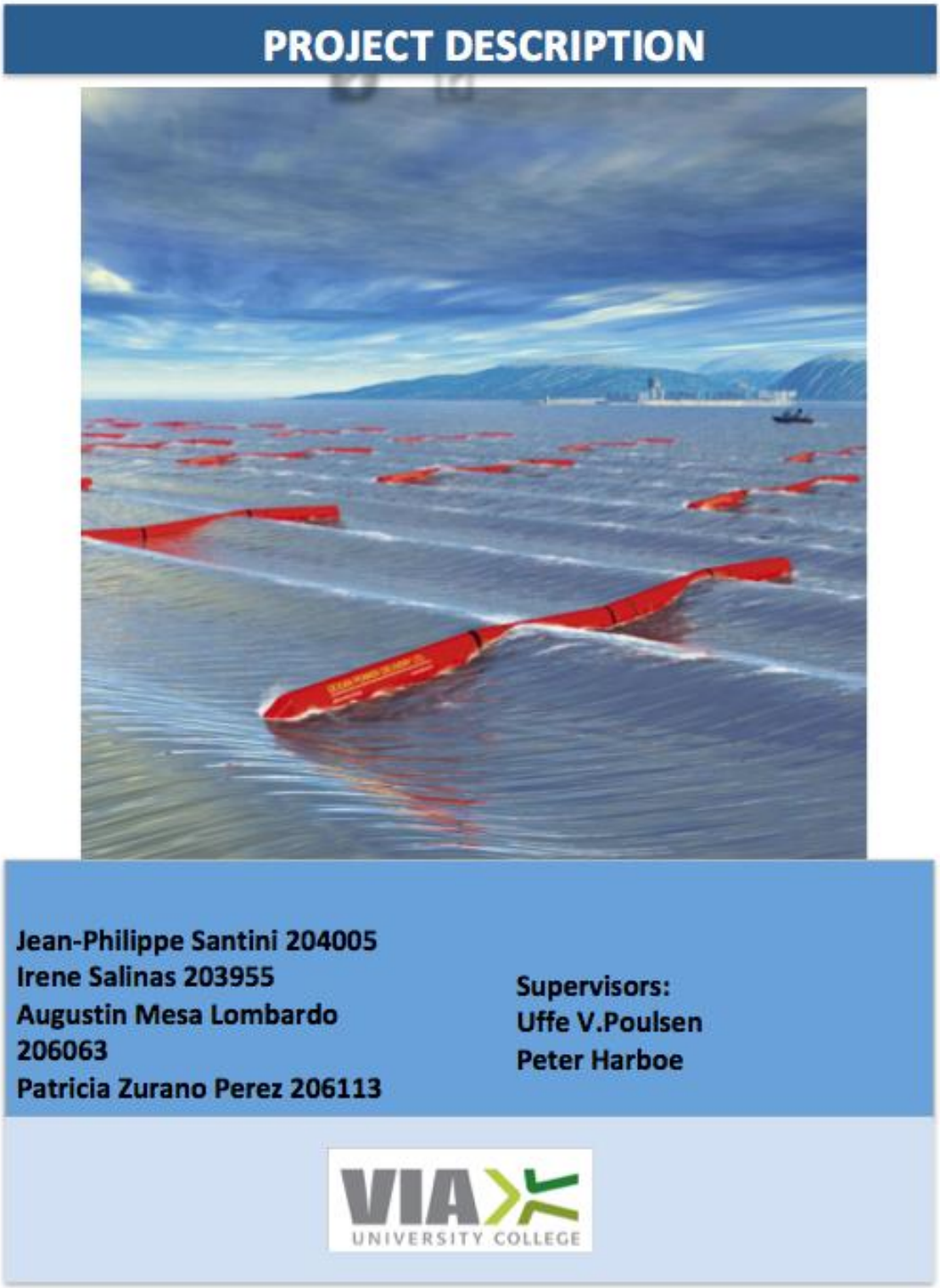
- Knowledge about a new market (renewable energy and electricity), especially as we made the study about France I learned some things that I didn't know before.
- New skills.
- A human adventure, which helped me, to learning to work with people from different cultures.
- No conflicts and very good atmosphere in the group.
- Coordinator support.
- Same way to work with my groupmate Irene, so it was easy to communicate and work together.

Disadvantages

- Lack of communication between Mechanicals and Businesses students
- Idioms misunderstandings.
- Not equal distribution of work between all project members.

- Failure to comply with my schedule and because of that other members of the group was late.

GBE's Project Description



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Background description

Today the environment and its conservation is a challenge for the safety of our planet. Many efforts and innovations have been made in recent decades to improve the impact of the modern way of life on environment, and also, the increasingly need for energy have put a focus on renewable energy. These energies, which unlike fossil fuels do not pollute the environment, provide energy with an environmental impact close to zero or even none. The most important renewable energy sources today are wind and solar, but there are other methods still underdeveloped with a high economical and technical potential. Those sources of so-called "green" energies are both very dynamic economic sector and carrier but also a path that would put in place a more sustainable and less polluting society.

It is in this context that we would focus our project in an original source of renewable energy, the wave energy. This type of marine energy is less developed than others such as tidal power, but its potential is equally high , since the waves are continuously generated in the seas and coasts of the planet.

The waves are the result of the effect of wind blowing over hundreds or thousands of miles offshore, resulting in a transfer of energy to the ocean surface. Therefore, they are a form of kinetic energy that can be accessed using various mechanisms that respond to harmonic wave motion, capturing some of its energy. Definitely, the wave energy is harnessing the kinetic and potential energy of waves to produce electricity.

The swell is understood from an engineering viewpoint as a tertiary derivative of solar energy. The unequal heating of the Earth's atmosphere generates wind, and the wind generated waves. Only 0.01% of the flow of solar energy is transformed into wave energy. One of the characteristic properties of waves is their ability to travel long distances with little energy loss. Therefore, the energy, which is generated anywhere in the ocean, is finished just in the continental edge, so its energy is concentrated on the coasts.

The energy contained in the waves varies from place to place, but in general, the further away they are from Ecuador, they contain more energy. Although local conditions, such as type of coast, where they generate and deep ocean, take great importance in the amount of energy. According

to estimates, it can be assumed that the wave energy flow in Europe could amount to 1,000 TWh per year, amounts to take into account for a future expansion in the use of this type of energy.

The WEC was first patented in France in 1799. However, the real development of this technology does not begin until the last quarter of the twentieth century. Norway and Scotland are pioneers and leaders in technology wave today.

Purpose

On the business part of our project the goal is to get an overall idea of the market of energy and renewable energy in the World, Europe and France, with its main actors (competitors), its trends and the demand of customer to define a valuable marketing plan.

Problem formulation

- What is the current state of the energy market, at Global, European and French level?
- Who will be our target group? To define the target group is one of the most important issues so we'll study our potential customers and try to fulfil their needs.
- Define the trends, motivations, and brakes of the potentiels customer of green electricity?
- What is the current competition on the market and what is their strategy?
- What could be the best Marketing Plan for a green energy supplier to implement the French electric market?
- Then when we define our target group, how to reach them?
- Which sales strategy set up? Objectives?
- What will be the cost of this sales strategy?
- Does the company could have benefits with the Marleting Plan that with set up?

Delimitation

In this project we are going to focus on the development of the new business. Especially on the business plan and the marketing plan. Since we do not have university formations law, we will not discuss the legal aspects and the various agreements required the implantation of electric power plants in the territorial waters. Moreover since we don't have special skills in the fields of finance and accounting our financial will be focus on the sales strategy (how much does the the strategy will cost), the possible turnover and earnings of

the company and thanks to the finance define the marketing objectives (number of customer).

Choice of models and methods

In the business idea, we try to think about current global problems that may require a solution according to our knowledge field. The objective of this part is to present and explain shortly all the model and different methods that we will use to accomplish our project.

1. Knowing the market of Energy, Renewable Energy and Wave Energy, the aim of this task is to have an overall image of the situation of the market (threats and opportunities), to figure out what could be the best positioning for us. The model that we will use, consist on an analysis of the environment (macro and micro) to choose a specific segment of the market, to differ of our competitors. At the end of this task we will make a analysis of our findings, this analysis will help you for determine the business model of our company. This analysis will also be helpful for the mechanicals students because they should use the study market to create an innovative and different product.
2. Competitors Analysis in order to make Benchmarking, find the positioning of competitors on the market and try to position our company.
3. Creation and application of a questionnaire in order to know the demand of potentiel customer.
4. Marketing Plan Template from the book “How to write a successful Business Model” by Stephen Lawrence and Frank Moyes from University of Colorado.
5. Financial data, it is very important in order to know if the business is going to be profitable and if it could be continued on the time, in other words, see if the business is going to succeed.

Time schedule

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