PROJECT FOR PROPOSAL
"WIND FARM IN POLAND"

Team C - Sirocco:

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1 ABOUT SIROCCO

1.The company

Sirocco is the world's leading manufacturer of wind turbines. We were pioneers when the industry was still in its infancy. And ever since those early days, the Sirocco name has stood for quality products and for the ability to think through every aspect of a project. We have already installed 4,817 MW (including associated companies) in 35 countries worldwide, which represents 26% of the total accumulated, installed capacity of wind turbines.

Main figures for Sirocco:

No. of employees as of 30 June 2001 :	
The Sirocco Group in total	4,711
Outside France	1,014
In addition in associated companies	1,145
The Sirocco Group and associated companies in total	5,856
Production facilities :	
Total area (located in France, Denmark, Germany, India, Spain and Italy)	187,658 m_
Turnover in millions of US Dollars :	
Turnover 1996	225
Turnover 1997	234
Turnover 1998	339
Turnover 1999	564
Turnover 2000	772
Installed MW worldwide in 2000 :	
Total	4,495 MW
Sirocco (incl. associated companies)	1,434 MW
Sirocco' s market share in 2000:	31.9 %
Accumulated installed MW worldwide as of 31 December 2000:	
Total	18,449 MW
Sirocco (incl. associated companies)	4,817 MW
Sirocco' s market share (accumulated):	26.1 %

Source: BTM Consult ApS - March 2001

2. The team

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3. Sirocco s technology

As we have been developing Wind turbines since 1985, Sirocco is proud to offer his customers the largest range of Wind electric generators available in the market. We manufacture nowadays different WEG in sizes of V47-660 KW, V47-660/200 KW, V52-850 KW, V66-1.75 MW , V66-2.0 MW (special offshore), and V80-2.0 MW. In January 2001, Sirocco has been chosen to supply the wind turbines for the first major offshore project in the North Sea — the Horns Rev project off the coast of Esbjerg. The project, which is to be completed during summer 2002, will be the largest offshore wind farm in the world to date, with a capacity of 160 MW. The turbine model chosen is the Sirocco V80-2.0 MW, and the order is expected to be worth around 119 million US Dollars.

4. Environmental and Occupational Health and Safety management

Sirocco has established a range of follow-up systems. A project group consisting of technical personnel from different departments actively carries out "product follow-up procedures" on new turbines and evaluates the need for improvements on the basis of feedback from commissioned products. The conclusions drawn by the project group are used to correct production and, if necessary, the commissioned products themselves.

In France, Sirocco has implemented an environmental management system that complies with ISO 14001 standards. On 22 August 2000, Germanischer Lloyd Certification GmbH presented Sirocco with the certificate that marks the provisional culmination of a long-term project.

The certification refers to the external environment and covers the activities of the company, Sirocco, worldwide.

In 2001, Sirocco is working to obtain certification according to the British OHSAS 18001 standard — a standard that applies to occupational health and safety. Sirocco considers OHSAS 18001 to be a natural extension of its present environmental certification. A wind turbine is a complex product, and the safety risk is an important aspect. That is why Sirocco has always been very concerned with occupational health and safety. As OHSAS 18001 shares many basic elements with ISO 14001, Sirocco has already completed a considerable amount of the work required to achieve certification according to the new standard.

5. Quality assurance

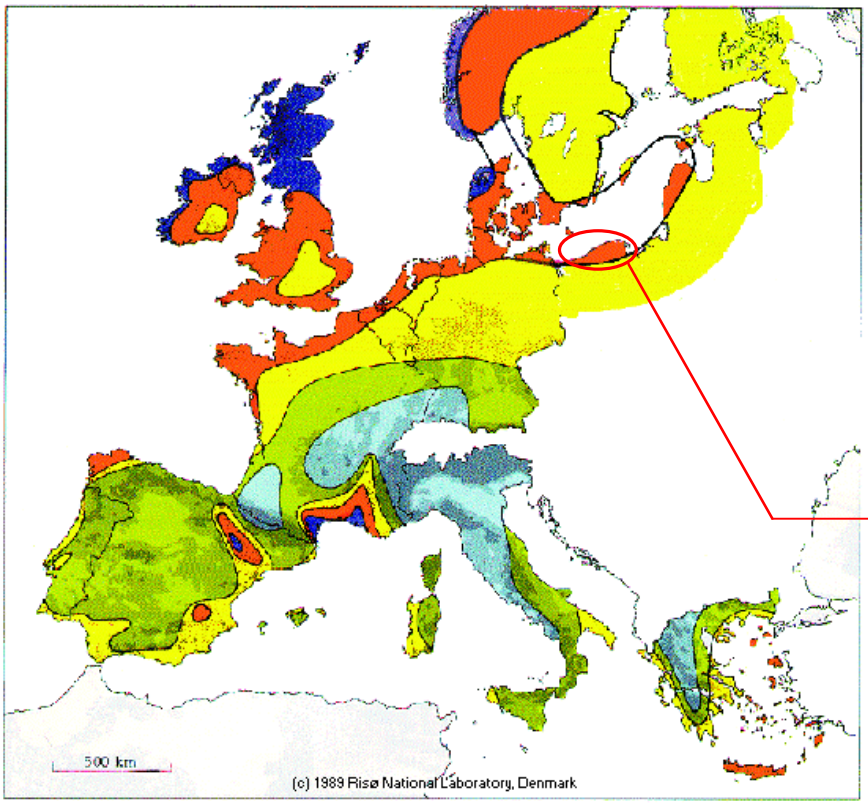
The purpose of a quality assurance system is to ensure that all products manufactured and supplied meet Sirocco' s specifications in full. This applies to all aspects of quality: product quality, on-time delivery, correct quantities and all other services. However, it also involves making sure that all suppliers live up to Sirocco's high standards. Only by ensuring that every link of the chain is equally strong can Sirocco maintain these standards - and continue to operate as a reliable partner.
Another purpose of quality assurance is to record and analyze the causes of any errors that may occur, and to allow Sirocco to locate, correct and prevent such errors. Sirocco was certified according to the ISO 9002 standard in 1991, and this certification was extended to the ISO 9001 standard in 1996.
Quality and care are key concepts at Sirocco. That is why Sirocco trains all employees and informs them about the group quality policy. The company also works to influence attitudes among both employees and partners to achieve understanding of Sirocco' s objectives and the need for shared efforts.
Sirocco' s policy is to manufacture all components that cannot be purchased externally in standard or slightly modified forms on the basis of total-economic considerations. This means that the group itself possesses the know-how required, which naturally makes Sirocco less dependent on sub-suppliers.
Every activity undertaken stems from requirements for quality and care. This naturally applies to product deliveries - but the services associated with the pre-sale phase, project management and erection, as well as subsequent service and maintenance, are also carried out in accordance with a set of fixed internal procedures.
Sirocco regularly visits selected suppliers and critically analyses all vital production processes. A "control agreement" is then drawn up between Sirocco' s quality department and the supplier's quality manager. This agreement ensures that all components are made to Sirocco' s specifications and thoroughly checked before delivery.

2 PROPOSAL

1 Implantation

To be efficient, a wind farm has to be properly located from meteorological, demographic and topographical points of view. It has to be in a SEZ and next to the roads and the electric grid.

1 Meteorological data



°	Sheltered terrain		Open plain		At a sea coast		Open sea		Hills and ridges	
°	m s‹_	W m‹_	m s‹_	W m‹_	m s‹_	W m‹_	m s‹_	W m‹_	m s‹_	W m‹_
	> 6.0	> 250	> 7.5	> 500	> 8.5	> 700	> 9.0	> 800	> 11.5	> 1800
	5.0 - 6.0	150 - 250	6.5 - 7.5	300 — 500	7.0 - 8.5	400 - 700	8.0 - 9.0	600 - 800	10.0 - 11.5	1200 - 1800
	4.5 - 5.0	100 - 150	5.5 - 6.5	200 — 300	6.0 - 7.0	250 - 400	7.0 - 8.0	400 - 600	8.5 - 10.0	700 - 1200
	3.5 - 4.5	50 - 100	4.5 - 5.5	100 — 200	5.0 - 6.0	150 - 250	5.5 - 7.0	200 - 400	7.0 - 8.5	400 - 700
	< 3.5	< 50	< 4.5	< 100	< 5.0	< 150	< 5.5	< 200	< 7.0	< 400

European Wind Atlas - (c) 1989 Risø National Laboratory, Denmark

This map shows the wind resources at 50 meters above ground level for five different topographic conditions. The best conditions in Poland are circled in red corresponding to a 7.5 $m.s^{-1}$ wind speed and located at the sea coast. Two provinces are interesting : **Zachodniopomorskie** and **Pomorskie**.

2 Economical Data

Ground s price

The middle price differs according to the regions. Less expensive grounds :

Province boundary	capital	Price (zl/ha)
Lubuskie	Zielona Gora	2491
Zachodniopomorskie	Koszalin	4479
Pomorskie	Gdansk	4601
Warminsko-mazurskie	Olsztyn	4349
Podkarpackie	Rzeszow	2171

SEZ

The **Pomorskie** region is part of the windy regions, the less expensive ground price and the SEZ ; this region will be the one analyzed for the implantation of the wind farm.

3 Electric connection

A power line will normally be installed to the nearest suitable electricity sub-station or other point of connection to the local distribution network. The cost for connecting the wind turbine generators to the electrical grid can vary a lot. The distance to the nearest connection point is a key issue.

4 Demographic and environmental data (annexes Maps: Land use)

The wind farms can have an impact on the environment and the people around them.

- **visual impact :** the most controversial environmental problem with wind farms is their visual intrusion and the impact on the landscape. This impact is very subjective. The wind farms design and the kind of landscape in which it has to be inserted have a huge importance. Our wind farms are designed to reduce this impact ; the location, the color and the shape will be well chosen.

- **noise :** there are 2 kinds of noise : the one created by the passage of the wind in the blades and the other produced by the rotation of the mechanical elements (gearbox, generator). The noise is easily minimized thanks to a judicious choice of the site s location respect to the topographical characteristics and the proximity of the habitations.

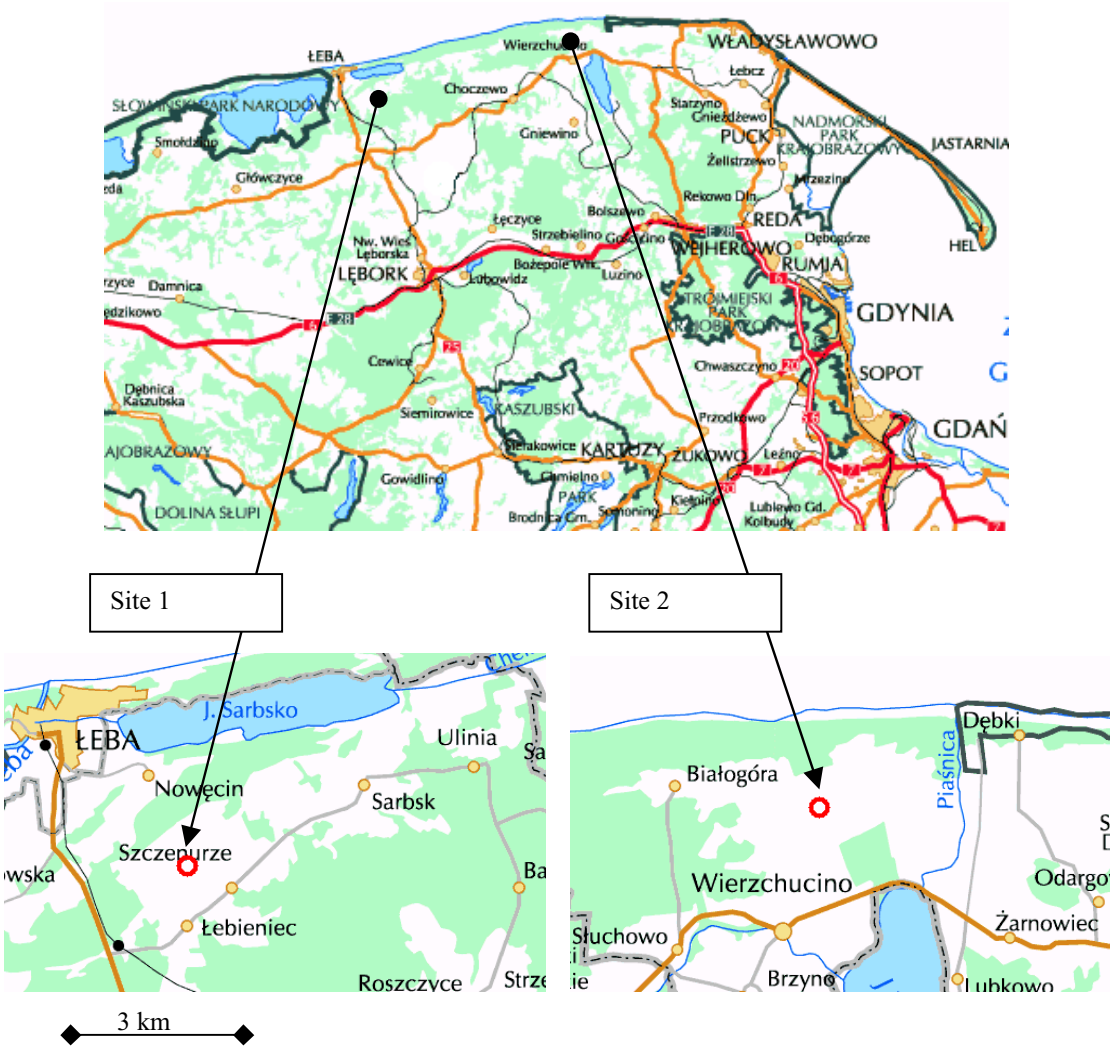
- **ecological perturbation :** 2 effects on birds : the direct collision and the reduction of their habitats. Those effects are insignificant but we will take precautions not t set up the site in a migration corridor.

- **electromagnetic interference :** the metallic elements are potential reasons of interference for the electromagnetic signals as radio and TV emissions and hertzian communications. Nevertheless, in most cases, if there are interference, there are cheap and efficient solutions as the installation of receptor or transmitter to grow the original signal.

- **security :** the blades, turning between 14 to 35 rpm, can easily be seen as a dangerous structure. In fact there are few chances of danger and it is minimized by serious controls during the construction.

The effects of the wind farms on the local environment are considered during the planning. In general, impacts are controlled by technical and esthetical solutions that don t have any effects on the project viability. However, it will be important to do local evaluations to anticipate those impacts and to provide against it.

5 Sites chosen (Annexes Legend 1)



Location:
17¡36'25" E˚-˚54¡43'58" N
Town : Leba

Location:
18¡1'3" E˚-˚54¡48'46" N
Town˚: Wierchucino

Site 1

Advantages

- Wind speed potential
- Sea proximity
- Size of the site
- Ground conditions

Drawbacks

- Proximity of dwelling (Visual impact, Noise assessment)
- Ground conditions

Site 2

Advantages

- Wind speed potential
- Sea proximity

Drawbacks

Site access

2 *Technical aspects*

1 Characteristics and performances

As we said, good, stable wind conditions are often found in unobstructed areas and close to the coast. However, there are many complex wind sites with high energy production potential. We recognized the need to make better use of the wind in these more demanding areas by developing the V52-850 kW. Many reasons made us choose this turbine :

An efficient and global solution opening up new horizons

The V52-850 kW turbine improves the exploitation of wind turbines resources. Through an intensive development of the V47-660 kW model, Sirocco have created a new turbine, offering a high degree of efficiency that is ideal for all wind conditions. The Sirocco V52-850 kW turbine is a pitch-regulated turbine with a 52 meter diameter three bladed rotor. The speed of revolution of the rotor can vary from 14.0 —31.4 rpm, allowing optimal energy capture at both high and modest wind speeds, while simultaneous ensuring the best possible power quality.

Proven performances

We spent months testing and analyzing the performances of the new Sirocco turbines. When we had a complete satisfaction, we made them pass an ultimate control asking an independent organism to verify the results obtained. This standard practice is a procedure called Proven Performance and is a guarantee of highest requirements for energy production, availability factor, power quality and sound levels.

Lower sound level

Sound levels are of crucial importance when deciding on the placement of wind turbines in populated inland areas- often at locations where wind speeds are low. Thanks to the low speed of revolution of the V52-850 kW turbine in modest wind speeds, Sirocco has taken yet another important step towards fulfilling requirements for a wind power solution with a low sound level. The OptiSpeed ™ feature makes it possible to program the turbine sound levels before installation so the operation of the turbine is tailor made for specific characteristics of the location.

Lightning protection

Naturally, the V52-850 kW model is equipped with Sirocco Lightning Protection, to protect the entire turbine from the tips of the blades to the foundation. The turbine has, of course, also been thoroughly tested and fully conforms with applicable IEC standards.

Reduction of the disadvantages of the low, high and often unstable winds

The V52-850 kW turbine is equipped with OptiSpeed™, a system that allows the turbine blades to rotate at varying speeds. This system allows the speed of revolution of both the rotor and the generator to vary by as much as 10%. With OptiSpeed™, the speed of revolution can vary by up to approximately 60%.
In short, OptiSpeed™ optimizes energy production, especially in modest winds, making it easy to adapt the operation of the turbine to the parameters of the electricity grid.

Low risk

The Sirocco V52-850 kW Turbine, relatively small unit size, reduces the risk of technical failure or industrial action compared with larger generating units.˚

Sirocco V52-850 kW Turbine

ROTOR	
Diameter:	52 m
Area swept:	2,124 m²
Speed of revolution:	26 rpm
Operational interval:	14.8-31.4 rpm
Number of blades:	3
Power regulation:	Pitch/OptiSpeed™
Air brake:	Feathered

TOWER	
Hub height (approx.):	44-49-55-60-65 m

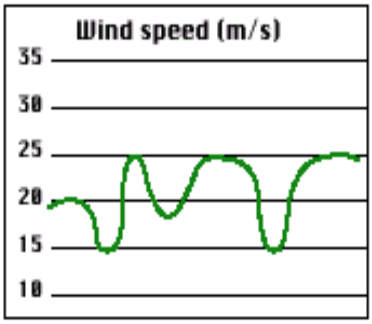
OPERATIONAL DATA	
Cut-in wind speed:	4 m/s
Nominal wind speed:	16 m/s
Stop wind speed:	25

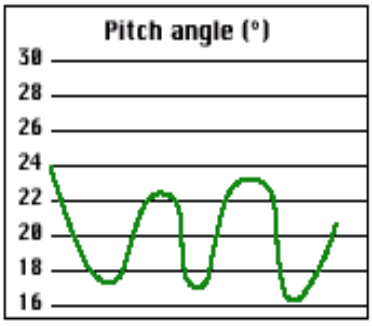
GENERATOR	
Type:	Asynchronous with OptiSpeed™
Nominal output:	850 kW
Operational data:	50 Hz 690 V

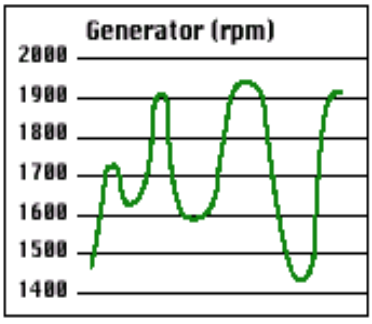
GEARBOX	
Type:	1 planet step/2-step parallel axle gears

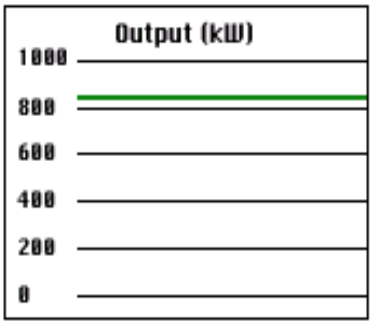
CONTROL	
Type:	Microprocessor-based monitoring of all turbine functions as well as OptiSpeed™ output regulation and OptiTip® pitch regulation of the blades.

WEIGHT					
	(44 m)	(49 m)	(55 m)	(60 m)	(65 m)
Tower:	41 t	48 t	56 t	64 t	71 t
Nacelle:	22 t	22 t	22 t	22 t	22 t
Rotor:	10 t	10 t	10 t	10 t	10 t
Total:	73 t	80 t	88 t	96 t	103 t

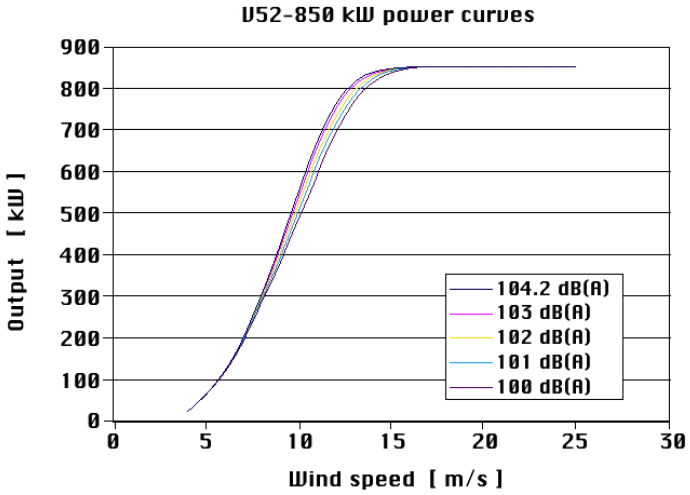






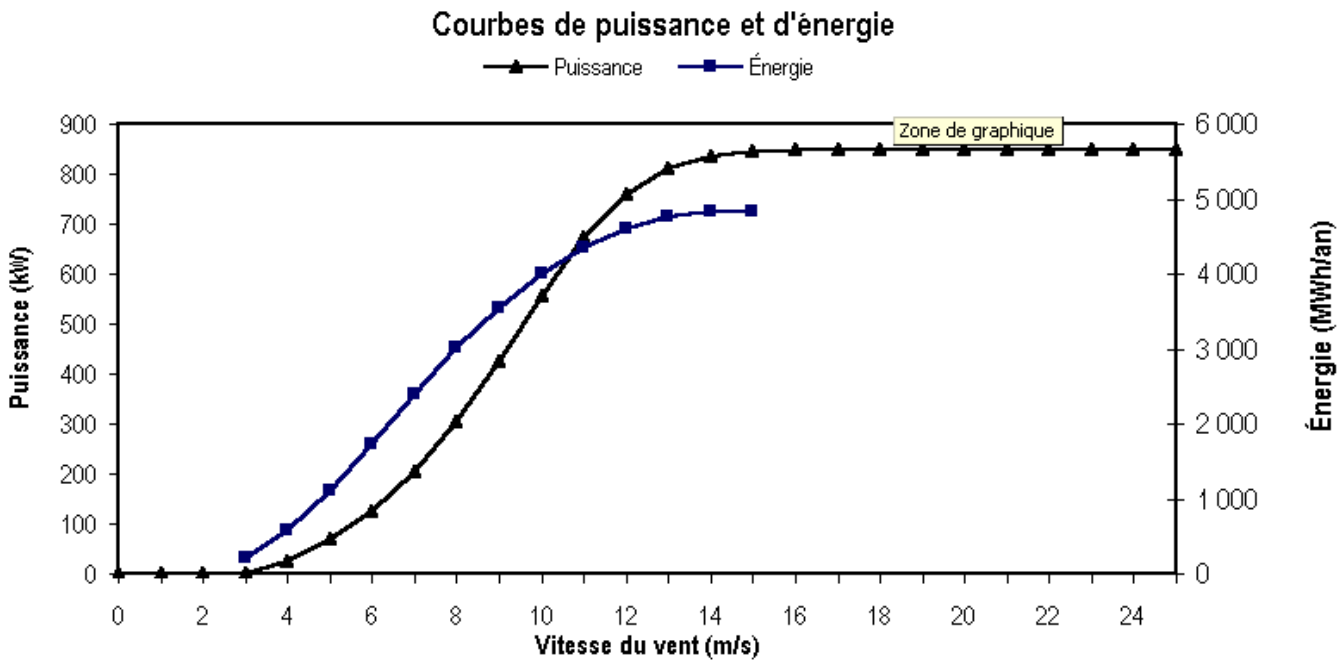


The sound output level can be adjusted by varying the speed of revolution and pitch angle of the turbine as illustrated in the figure below.



2 Specific data

		datas per wind turbines	total data
wind turbines power installed	kW	850	15 300
	MW	0,85	15,3
energetic production uncorrected	MW	3 268	58 819
barometric correction coef.	-	0,99	0,99
thermic correction coef.	-	1,03	1,03
energetic production gross	MW	3 332	59 977
losses coef.	-	0,90	0,90
specific output	kW/m?	1 418	1 418
wind farm power factor	%	40%	40%
renewable energy capted	MW	3 011	54 198
renewable energy supllied	MW	3 011	**54 198**
	GJ	10840	195112
surplus available of energy	MW	N/A	



3 Maintenance

The maintenance on Sirocco s Turbines is very rare. A team will realize it every 6 months in order to analyzed the performances, the electronic and mechanic parts and to correct the defaults. (human resources part).

4 Certifications

The design and the production process of the wind turbine generators are certified according to the ISO 9002 standard since 1991, the ISO 9001 standard since 1996 and the ISO 14001. The wind Turbines are certified CE.

3 Planning (annexes planning)

This planning will be presented to the local authority for agreement. Modifications may be added later by this local board.

The sorts of issues that will normally be considered appropriate for planning conditions or a planning obligation are as follows :

Control of noise emissions ;

The regulation of construction access so as to avoid traffic hazards and promote highway safety ;

The decommissioning of the development once electricity ceases to be generated. The local planning authority may wish to be sure that all the surface remains of the development are removed and the site restored to a suitable condition ;

The avoidance of undue interference with electronic transmission systems, including television. The local planning authority may wish to be sure that any interference to transmission systems anticipated by the developer is satisfactorily remedied ;

Control of implementation of the development so as to avoid or limit damage to fauna and flora. This form of regulation may often be achieved by well drafted and enforceable Environment Management Plans ;

Control of the design and color of wind turbines.

4 Administration

1 Public relationship and local communication

It s well known that wind energy development occasions population s reactions. European Wind Energy Association (EWEA) is established as a professional association for those involved in wind energy research and development. It strongly invites local planning authorities to encourage adherence to the best Practice guidelines of the European Wind Energy Association . Our Public Relation Department promotes projects by forging partnerships with landowners, local communities, power purchasers/marketers, utilities and investors, according to the ***best Practice guidelines of the European Wind Energy Association*** :

- at the initial step, contacts must be taken with the site owner and the local planning authority : the existing uses of the land will be carefully discussed with the landowner, any tenants to determine whether and how best the wind energy project can integrate the existing uses.

- the EWEA recommends that an ENVIRONMENTAL IMPACT ASSESSMENT STUDY is conducted ; as well, as looking at reports and maps of the area in order to determine environmental issues, we will have regard to existing and emerging national, regional and local planning policies.

On 25 June 1998, on the occasion of **the fourth "Environment for Europe" Ministerial Conference in Arhus, Denmark,** 35 countries (including **Poland**) and the European Community signed the new UN/ECE Convention on Access to Information, Public Participation in decision making and access to Justice in Environmental Matters. This European resolution tends to˚:

- ˙˚***Call upon each Government to promote environmental education and environmental awareness among the public, particularly in relation to the opportunities that this Convention provides;***

- ***Call upon public, private and international fund providers to give high priority to projects that aim to further the objectives of this Convention;***

- ***Call for close co-operation between ECE, other bodies involved in the "Environment for Europe" process and other relevant international governmental and non-governmental organizations on the issues of this Convention, for example in the implementation of national environmental action plans and national environmental health action plans˚¨;***

For a closer contact with polish population, our **Public Relations and Legal Expert** will establish an agenda for regular information meetings.

Our targets will be:

- Universities.
- People who live close to the wind farm.
- Existing industries and companies.
- Environmental societies.

Our communication media s will be˚:

- Public conferences.
- Press releases.
- Statement to the local press on the procedure for the settlement, the knock-on effects on the everyday life and the environment.

Boarding at the wind farm site with general information concerning the evolution of the project, address of our law responsible

2 Human resources

Since September 1998, the decrease of unemployment started in 1994 in Poland, has stopped and the number of unemployed people has strongly increased from 1,7 million in august 1998, up to 2,52 million in February 2000. Thus, the unemployment level has reached the level of 13,9%. It s noteworthy to indicate a large difference of unemployment level between the polish regions : Pomorskie and in the west Pomeranie possess the higher level of unemployment in Poland : 15,5% in January 2001. At the beginning of the year, Polish government has revealed its ***National Strategy of employment and Management of human resources*** ; its purpose consists in increasing the level of employment in the population aged for working till reaching the level of the European Union.

In order to obtain good results quickly, political and fiscal measures will be proposed by the Polish government :

- Introduction of a minimum wage based on the European Union model.

- More flexibility in working hours.

- Increase of overtime hours up to 416 hours.

3 Environmental considerations

Poland has perceived the EU integration as an indispensable element of transformation process. Due to this, Poland will target to achieve a share of 12% renewable energies. That is the reason why the idea of the membership has been commonly accepted by about 80 percent of the Polish population.

Achieving these ambitious integration objectives in the field of environmental protection requires enhanced adjustment efforts, methods for their implementation, definition of needed financial outlay and sources of origin of these resources, and also bringing the co-operation closer together between the EU and both, member and candidate countries.

According to ***the best Practice guidelines of the European Wind Energy Association*** , an environmental management Plan will be realized. It s a document which crystallizes agreed proposals to minimize the environment impact of construction activities and working practices, referring to the European community Directive on environmental assessment (85/337/EEC).

This document will be signed between us and the local planning, environmental authority and local population delegate of Pomorskie and west Pomeranie and will establish :

- a visual and landscape assessment : a zone of visual influence will be carefully described in order to not disturb the local population. Design and colors of our wind turbines will be correctly adapted.

- a noise assessment : as above, we will respect the advisable distance between residences and the wind farm.

- an ecological assessment˚: this site has also been chosen because the fauna and the flora are weakly present.

- interference with telecommunication system˚: we have checked that in this site, communication system user will not be disturbed.

- decommissioning˚: considerations will be given to restoration measures including the removal of equipment because the local planning authority wish to be sure that the site will be restored to a suitable condition.

All these environmental negotiations will be conducted with polish institution s involved in environmental respect :

- Environment information center.

- Ministry for environmental protection that edited ***a guide to project identification and preparation in Central and Eastern Europe October 1997.***

- National Fund of environmental protection and water management.

- The institute for environmental protection.

- The Chief of inspectorate for environmental project.

- The Institute for meteorology and water management.

- Global Resource Information Database is a included in the program established by United Nations Environment Program.

4 Incentives and subsidies

The Polish economic success of the last decade resulted from a number of joint activities, of which foreign investment used to have enormous significance. As the level of investment reached almost 50 billion dollars in 2000, Poland is included among the leader countries of Central-Eastern Europe. From year to year, foreign investors recognize the investment climate created by state authorities and business environment institutions as more and more favorable. The high estimation of Poland as an investment location is the result of :

- the perspective of the country's fast economic growth.
- the highly qualified and inexpensive workforce.
- Poland's access to European Union in the near future.
- its geographical position and the large market.

The government's incentive policy is another factor largely influencing investment decisions. The act on public aid, which is now the fundamental act regulating investment activity in Poland, became effective in January 2001.

Current tax status°:

- The corporate income tax (CIT) rates fell to 34% - as of 1999; 28% - as of 2001; 22% as of 2004.

- The number of depreciation rates was reduced to 10, e.g. :

RATE (per cent) NAME OF TANGIBLE FIXED ASSET
1.5 Housing buildings and apartments
10 Technical appliances
14 Internal-combustion engines; metal working machines; plastic, chemical- and food-industry machinery
20 Motor vehicles
30 Computer hardware

- Operating losses can be carried forward for three years in three equal deductions.

- Investment in Pomorskie and west Pomeranie included in special Economic Zones will give us greater incentives°: Complete exemption from CIT or PIT (personal income tax) up to a max. amount of 50% of investment inputs and inputs for creating new employment. Property tax exemption is possible.

Grants for employment of the unemployed :

- Reimbursing the cost of employee training - up to 50% of costs;
- Reimbursing the social insurance contributions - up to the level of threefold the minimal salary;
- Loans for employers to create new employment - possible redemption of up to 50%;
- Reimbursement of costs incurred on employing graduates (remuneration + awards + social insurance contributions) - for the period of up to 12 months, or 18 months in case when the reimbursement concerns alternate months;
- Reimbursement of costs incurred on employing unemployed persons (12 months maximum).

Competent authority: District (Powiat) Employment Office, Head of a powiat

Grants dedicated for employment of unemployed disabled :

Reimbursement of pension, disability pension, health and accident contributions;
Reimbursement of costs incurred on employing disabled persons (remuneration for 18 months);
Financing the establishment or adaptation of workplaces for disabled persons.

Competent authority: State Fund for Rehabilitation of the Disabled, Head of a powiat

One of the most important objectives of the Polish government is to improve the environmental situation of Poland in view of integration to the European Union ; the policy of sustainable development can prove to be highly beneficial in the context of international co-operation.

Poland, because of its catastrophic environmental situation, has an opportunity to attract external financial resources devoted to the reduction of global threats, since they can be more effective in Poland than in the developed countries. This will also enable easier access to foreign aid for environmental projects, for economic restructuring that will benefit the environment and for the protection of valuable natural resource complexes. Activities, undertaken to support sustainable development, will promote credits, transfer of technology, and reduction of debts.

2 ***Marketing***

1 Wind energy in Poland

In Poland actually the installed wind energy power rates around 8 MW

Polish wind turbines have been installed most in the beginning of the nineties. They are mostly sited as single constructions at the Polish Baltic sea shore. The single wind farm in Poland, located in Cisowo near Darlowo, is the result of our business activities.

2 Our product

The wind power farm is a direct appliance to the polish electric network. The goal of this project is to provide Polish people with ˚cheap˚ electric power and to generalize this type of electricity generation, which now costs less and is ecological.

Moreover, to be part of European Community, Poland has to produce 12% of renewable energy and actually its actual rate is only 4%.

Therefore, our proposal incorporates all these criteria.

Our turbines are equipped of Optispeed: a system which allows the pales to turn in variable speeds. Optispeed allows a variation of the order of 10 % of the speed of the rotor and the generator allowing so a seizure of energy optimal in modest and high speeds of wind while guaranteeing the best quality of possible power. The function Optispeed allows also to program the sound levels of the turbine before the installation so that the functioning of the turbine is "to measure" with regard to the specific requirements of the location

Sirocco type V52-850 KW Wind Electric Generators have proved themselves to be reliable models in the World. Around 2200 Nos. Sirocco type V52-850 KW have been installed in most of the Wind Farm sites in the World. The Sirocco V52-850KW WEG is suitably designed to meet the Polish conditions.

- Specially designed for Polish climatic condition.

- Electrical system is suitably designed to withstand fluctuating Polish grid conditions

- Assured quality with high reliability components.

- Simple and user-friendly local controls system for operating with an option for central monitoring and control system.

- Sturdy Lattice and Tubular Tower.

1 Human resources

1 Human needs

We can divide the human needs in 2 phases:
- Set up of the wind farm
- Exploitation

The installation of the wind farm

Obviously, this phase will require the most important human needs of the JV.
As we have a strong experience in wind farm installation, we ll need 30 persons to set up the wind mills. This team will be divided in 6 teams (one team per mill), 5 persons per team.

We propose this composition for each team:
- 1 Sirocco team leader
- 4 specialized workers who will be recruited by JPA in Poland

The use of Polish s workers aims to get subsidies from Poland state.
It will be also a great moment for us to recruit the best worker for the wind farm s exploitation.

The exploitation of the wind farm

We believe, as you say in your RFP, that a strong board of director is important. In fact, it will be one of the first polish wind farm so we need efficient and dynamic people. In this way, we have chosen this board of director:
Let us explain why we ve chosen this organization.

- We want to keep the CEO because of our experience in Wind farm but also because we bring the main part of equity. But we re sure we will discuss this point further in the future.

- The COO would have to be someone who gets a strong knowledge of local administration and people. This COO will be in charge of local public relationship: local administration, landowners, university.

- The 2 technical expert won t have the same responsibilities :

  The sirocco s one will be in charge of the mechanical s part and JPA s one of electronics part. Please see the section **technological transfer** to know further about this point.

- Moreover of this board operator, we need 2 skilled workers to maintain the wind farm. We think that this 2 workers have to be recruited from the people who have set up the farm.

2 Technological transfer

The technological transfer is one of the most important points of this joint venture. We ll bring you our technical knowledge of wind farms. We will make an important effort to train at every step of construction and exploitation. Moreover we want to develop a strong relation with the local university of Gdansk.

Intern formation

- Skilled workers

The training of skilled workers will be done by sirocco s team leader during the set up of the farm. It will be a very empirical trainingn but this kind of job requires these skills.

- Technical expert

The training of your technical expert will be divided in 2 parts:

- **Theory**, your technical expert comes to France for a training period of 8 weeks. This training will be assumed by our engineer for the electronics aspect. This way, he will be able to see our wind farms and gets empirical knowledge.
- **Practical**, this period will be spent in Poland during the wind farm set up. We ve planned a 18 weeks training period, the formation will be assumed by one technical expert from Sirocco. This period will be a great moment, for your employee , to have a strong experience of wind farm assisted by our engineer.

- Exploitation

To keep a high level of competition and technology, we ll assume one month of training period per year. In this way, we ll send one of our technical expert for a month. He ll have to train the 2 technical experts to new technologies and to check the wind farm.

The other point of his training will be to give lessons at Gdansk university.

University

According to the European directives, the firm which produce renewable energy have to develop strong relationships with local communities.

We want to incite university education on wind energy. In France, this kind of relationship between university and firms gives good results. This way, we cover 2 important needs :

- Good local relationship
- Technician of wind energy

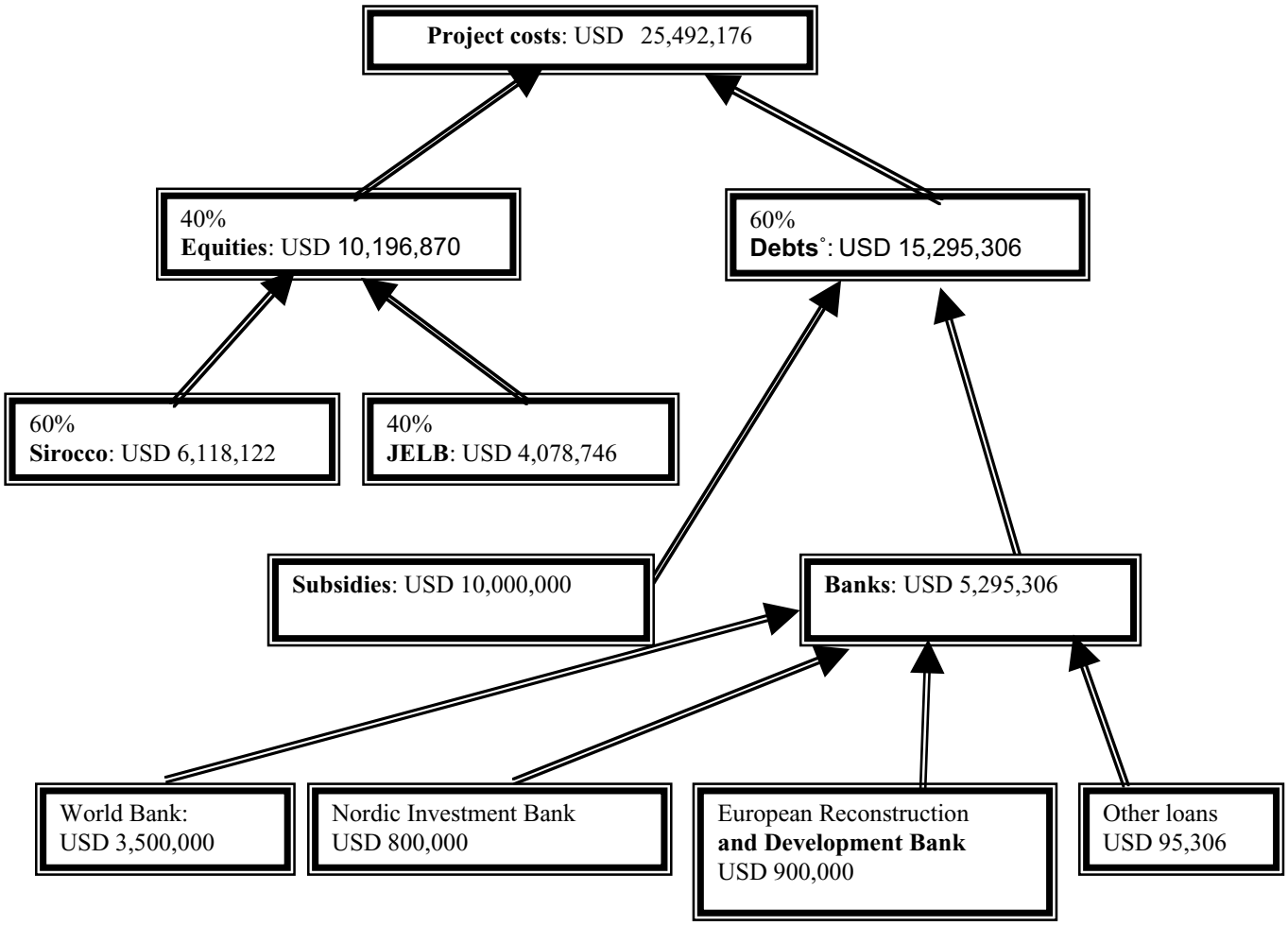
3 Financial point

1 Short term project: 15 MW wind farm

Our first goal is to build a 15MW wind farm in Pomorskie. In the beginning, this project will require a huge investment from our both companies: thanks to our estimations, we can already have an idea of how much we will have to invest.

Project costs **: USD 25,492,176**

Insofar as we are planning to build this wind farm in a SEZ, we can benefit from tax decreases: this can help us first.
On the other hand, we won t have any problems to find banks for loaning money : 60% of the project can also be funded by debts. We can count on subsidies, which should be around USD 10,000,000. Several bonds from different banks will fund the necessary debts : we will need to loan USD 5,295,307, with an interest rate of 5.5%. The bonds will last 10 years.
For the other 40%, we are ready to provide 60% of the equities necessary to the project : USD 6,118,122. We estimate that we take more risks in this operation, and we also think that we will benefit from 60% of the profits, and that you will benefit from the rest (it means too that we will pay 60% of the losses, if the project is not as good as expected).



SIROCCO

Cost Analysis

Investment Costs	Item	Quantity	Cost/Item	Amount
Feasibility Study				
Site inspection	day-person	6	$ 800	$ 4 800
Wind potential estimation	meteorological tool	6	$ 22 000	$ 132 000
Environmental estimation	d-p	8	$ 800	$ 6 400
First conception	d-p	18	$ 800	$ 14 400
Detailed cost estimation	d-p	18	$ 800	$ 14 400
Report preparation	d-p	8	$ 800	$ 6 400
Project management	d-p	6	$ 800	$ 4 800
Travel and accommodation	trip-person	4	$ 3 000	$ 12 000
Other costs	-	0	$ -	$ -
Sub-total:				**$ 195 200**
Development				
Negotiation	d-p	20	$ 1 200	$ 24 000
Approbations	d-p	250	$ 800	$ 200 000
Land	project	1	$ 30 000	$ 30 000
Survey	d-p	50	$ 600	$ 30 000
Project funding	d-p	100	$ 1 500	$ 150 000
Laws and accounting services	d-p	100	$ 1 200	$ 120 000
Project management	Year-p	1,25	$ 130 000	$ 162 500
Travel and accommodation	Trip-p	18	$ 3 000	$ 54 000
Other costs	-	0	$ -	$ -
Sub-total:				**$ 770 500**
Engineering				
Wind power tower localization	d-p	175	$ 800	$ 140 000
Mechanical conception	d-p	100	$ 800	$ 80 000
Electrical conception	d-p	150	$ 800	$ 120 000
Civil Engineering	d-p	90	$ 800	$ 72 000
Contracts	d-p	110	$ 800	$ 88 000
Work supervision	year-p	0,85	$ 130 000	$ 110 500
Other costs	-	0	$ -	$ -
Sub-total:				**$ 610 500**
Energetic equipments				
Wind power tower	KW	15 300	$ 1 000	$ 15 300 000
Spare parts	%	3,0%	$ 15 300 000	$ 459 000
Transport	wind power tower	18	$ 33 000	$ 594 000
Other costs	-	0	$ -	$ -
Sub-total:				**$ 16 353 000**
Allied infrastructures				
Wind power tower foundation	wind power tower	18	$ 78 000	$ 1 404 000
Wind power tower erection	wind power tower	18	$ 52 000	$ 936 000
Approaches	Miles	8,50	$ 50 000	$ 425 000
Network and transformer	Project	1	$ 2 650 000	$ 2 650 000
Maintenance building	Building	1	$ 125 000	$ 125 000
Transport	Project	1	$ 68 000	$ 68 000
Other costs	-	0	$ -	$ -
Sub-total:				**$ 5 608 000**
Other Costs				
Training	d-p	40	$ 800	$ 32 000
Set up	d-p	50	$ 800	$ 40 000
Interests	%	3,0%	$ 23 537 200	$ 706 116
Unexpected costs	%	5%	$ 23 537 200	$ 1 176 860

Total Investment Cost:				**$**	**25 492 176**

These costs are just the investment costs, for the set up of the wind farm. We ve also calculated the operation costs that our joint venture will require every year :

Year costs	Items	Quantity	Cost / Item		Amount
Operation and maintenance					
Land renting	%	2,0%	$ 2 709 892	$	54 198
Land taxes	%	0,0%	$ 2 709 892	$	-
Assurance	%	3,0%	$ 2 709 892	$	81 297
Transport line maintenance	%	3,0%	$ 2 650 000	$	79 500
Labor	Persons			$	100 266
Community Profits	-	1	$ 15 000	$	15 000
Travel and accommodation	Trip-p	12	$ 3 000	$	36 000
Administrative and other costs	%	6%	$ 366 261	$	21 976
Other costs		0	$ -	$	-
Unexpected costs	%	10%	$ 366 261	$	36 626
Total year cost				**$**	**424 862**

Further more, each year, the joint-venture will have to pay back the bonds:

Total year cost = Operation costs + Bonds pay back
= 424,862 + 702,608 = USD 1,127,470

Thanks to these figures, we can find the following ***cash flows*** :

year #	Cash flows $
0	(10 196 176)
1	3 244 400
2	3 357 031
3	3 472 897
4	3 592 090
5	3 714 708
6	3 840 848
7	3 970 613
8	4 104 108
9	4 241 440
10	3 102 635
11	3 310 640
12	3 412 161
13	3 516 784
14	3 624 601
15	2 287 413
16	3 850 213
17	3 968 212
18	4 089 812
19	4 215 124
20	2 705 645
21	4 477 340
22	4 614 479
23	4 755 804
24	4 901 440
25	5 051 519

The joint-venture will cover its initial investments after 3,7 years. And finally, we have calculated that this project will have an Internal Output Rate of 26,4% and an Actual Net Value of USD 12,254,346, which is a good result compared to our former experiences.
We can also think that this project is a very good investment for both firms, and can expect to develop an other project: an offshore wind farm in Poland.

3 STRATEGY

1 Reasons for Going Offshore

1. **Land Sites in Short Supply in Some Countries**

One of the primary reasons for moving wind farm development offshore is the lack of suitable wind turbine sites on land. This is particularly the case in densely populated countries with a relatively flat landscape.

2. **Higher Wind Speeds**

Equally important, however, is the fact that wind speeds are often significantly higher offshore than onshore. An increase of some 20 per cent at some distance from the shore is not uncommon. Given the fact that the energy content of the wind increases with the cube (the third power) of the wind speed, the energy yield may be some 73 per cent higher than on land. Economically optimized turbines, however, will probably yield some 50 per cent more energy at sea than at nearby land locations. (Bear in mind, that since the fuel is free, economically optimal wind turbines will generally have capacity rates as low as 25 to 30 per cent).

3. **More Stable Winds**

It is a frequent misunderstanding that wind power generation requires very stable winds. In most wind turbine sites around the globe, in fact, the wind varies substantially, with high winds occurring rather infrequently, and low winds occurring most of the time.

If we look at the typical statistical wind distribution, most of the energy output is in fact produced at wind speeds close to twice the average wind speed at the site. In addition, in e.g. Europe and a number of other locations around the globe wind speeds happen to be positively correlated with peak electricity use (more wind during the day than at night, more wind in winter than in summer) raising the value of the wind to the grid by 40 to 60 per cent, compared to a completely random wind pattern.

Having said this, it should be added, that of course it is generally an advantage to have a stable power output form a wind park. At sea, periods of complete calm are generally extremely rare, and quite short-lived. Thus the effective use of wind turbine generating capacity will be higher at sea than on land.

4. **Huge Offshore Wind Resources**

Offshore wind resources are enormous: Wind energy resources in the seas of the European Union with water depths up to 50 meters are easily several times larger than total European electricity consumption.

The offshore wind resource is obviously somewhat unevenly distributed among countries.

5. **Low Surface Roughness: Cheaper Turbines**

Another argument in favor of offshore wind power is the generally smooth surface of water. This means that wind speeds do not increase as much with the height above sea level as they do on land. This implies that it may be economic to use lower (and thus cheaper) towers for wind turbines located offshore.

6. Lower Turbulence: Longer Lifetime

The temperature difference between the sea surface and the air above it is far smaller than the corresponding difference on land, particularly during the daytime. This means that the wind is less turbulent at sea than over land. This, in turn, will mean lower mechanical fatigue load and thus longer lifetime for turbines located at sea rather than land. No precise calculations are as yet available, but we may guess at something like 25 to 30 year lifetime for a turbine with a design lifetime of 20 years on land.

7. Conclusions

Economic Benefits

Offshore wind energy is clearly an economically viable technology for the 21st century. The present technology indicates generating costs in the range of 4 to 5 US cents per kWh, according to IEA standard methodology (on the basis of 120 to 150 MW projects at water depths from 5 to 15 meters). Even without the environmental benefits included, offshore wind energy is thus very close to being competitive, both in comparison with onshore wind, and in comparison with other generating technologies.

Environmental Benefits

Offshore wind energy can make a significant impact on the emission problems related to conventional power generation technologies, partly because the offshore wind resource base is huge, partly because the technology is cost competitive.

The Danish example shows, that costs of mitigating CO2 problems can be brought down to a tolerable level. In fact, even though Denmark has a 7 per cent wind energy penetration in the electrical grid, electricity prices in Denmark (excluding indirect taxes) are still among the very lowest in the European Union.

System Requirements

Large amounts of wind power will of course require a more flexible electrical grid than what we know today, both in terms of handling a fluctuating power input, and in terms of the flexibility of other types of power plant (and possibly user load) in the system. In cases where there is a possibility of combining hydro power and wind, large scale introduction of wind would appear to be a particularly attractive option, since hydro is the cheapest form of electricity storage available.

Challenges

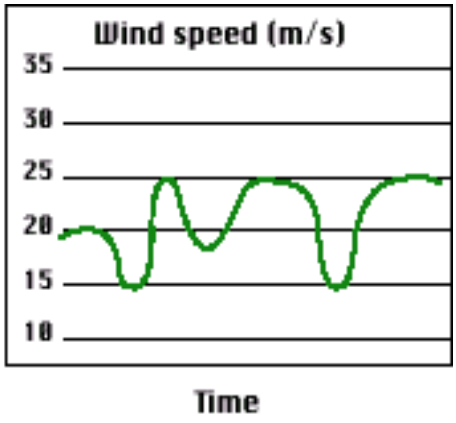
Offshore wind energy opens a new frontier of technological challenges. Further up scaling of wind turbines, which are already the largest rotating machinery on earth, will be a challenge to manufacturers. Other challenges can be found in mass production of cheap foundations, and improving the logistics of installation, surveillance, and efficient maintenance.

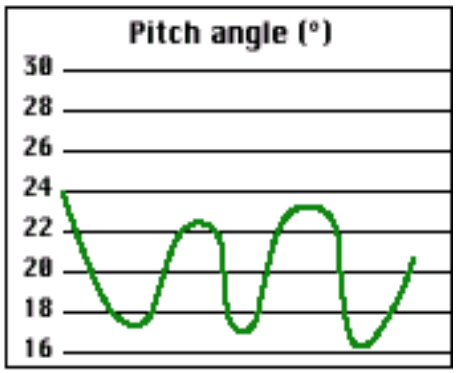
Watch the seas around Denmark a bit after the year 2000 to catch a glimpse of the first commercial sized offshore wind farms in Europe.

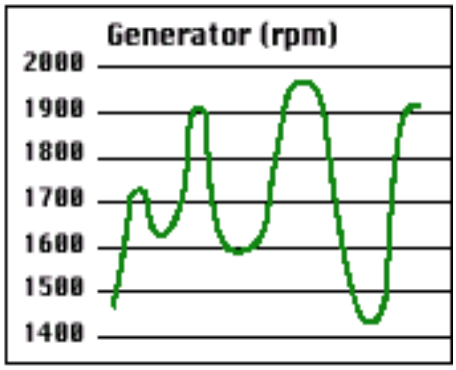
2 Technical proposal

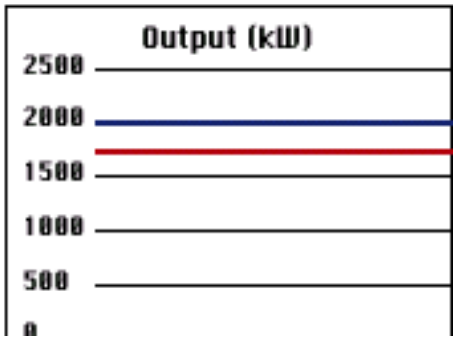
ROTOR	V66-1.75MW	V66-2.0 MW (offshore)
Diameter:	66 m	66 m
Area swept:	3,421 m²	3,421 m²
Revolution speed:	21.3 rpm	21.3 rpm
Operational interval:	10.5-24.5	10.5-24.5
Number of blades:	3	3
Power regulation:	Pitch/OptiSpeed™	Pitch/OptiSpeed™
Air brake:	Feathered	Feathered
TOWER		
Hub height (approx.):	60 - 67 - 78 m	60 - 67 - 78 m
OPERATIONAL DATA		
Cut-in wind speed:	4 m/s	4 m/s
Nominal wind speed:	16 m/s	17 m/s
Stop wind speed:	25 m/s	25 m/s
GENERATOR		
Type:	Asynchronous with OptiSpeed™	Asynchronous with OptiSpeed™
Nominal output:	1,750 kW	2,000 kW
Operational data:	50 Hz/60 Hz 690 V	50 Hz/60 Hz 690 V
GEARBOX		
Type:	1 planet step 2-step parallel axle gears	1 planet step 2-step parallel axle gears
CONTROL		
Type:	Microprocessor-based control of all the turbine functions with the option of remote monitoring. Output regulation and optimisation via OptiSpeed™ and OptiTip® pitch regulation.	

WEIGHT (approx.)	(60 m)	(67 m)	(78 m)
Tower:	100 t	117 t	159 t
Nacelle:	57 t	57 t	57 t
Rotor:	23 t	23 t	23 t
Total:	180 t	197 t	239 t









1 Offshore wind power research

Megawatt sized wind turbines, cheaper foundations and new knowledge about offshore wind conditions is improving the economics of offshore wind power.
While wind energy is already economic in good onshore locations, wind energy is about to cross another frontier: The economic frontier set by shorelines. Researchers and developers are about to challenge conventional wisdom on electricity generating technologies : Offshore wind energy is rapidly becoming competitive with other power generating technologies.

2 Offshore Foundations: Tripod

The tripod foundation draws on the experiences with light weight and cost efficient three-legged steel jackets for marginal offshore fields in the oil industry.
From a steel pile below the turbine tower emanates a steel frame which transfers the forces from the tower into three steel piles. The three piles are driven 10 to 20 meters into the seabed depending on soil conditions and ice loads.
The advantage of the three-legged model is that it is suitable for larger water depths. At the same time only a minimum of preparations are required at the site before installation.

3 Corrosion

Corrosion is not a major concern with offshore steel structures. Experience from offshore oil rigs has shown that they can be adequately protected using cathodic (electrical) corrosion protection. Surface protection (paint) on offshore wind turbines will routinely be delivered with a higher protection class than for onshore turbines. Oil rig foundations are normally built to last 50 years. This is also the design lifetime for the steel foundations used in these studies.

4 Multi-pile technology

The foundation is anchored into the seabed using a relatively small steel pile (0.9 m diameter) in each corner. Because of the piling requirement, the tripod foundation is not suited for locations with many large boulders.

5 Size Considerations

This type of foundation is not suitable at water depths lower than 6-7 meters. The main reason for this is that service vessels at low water depths will face problems approaching the foundation due to the steel frame.

6 Park Operation, Logistics

Remote surveillance of offshore parks will obviously be even more important than on land. Radio links for this purpose have already been in operation at the Tunoe Knob and Vindeby offshore wind parks for some years. With the large 1.5 MW units foreseen for these parks, it may be economic to install e.g. extra vibration sensors, a technology which is well known in industry to ensure optimum maintenance of machinery.

Since weather conditions may prevent service personnel from approaching the wind turbines at times of bad weather, it is extremely important to ensure a high availability rate of offshore wind turbines, (similar to the 98 to 99 per cent average achieved by onshore turbines). Preventive maintenance check programs may need to be optimized for remote offshore locations.

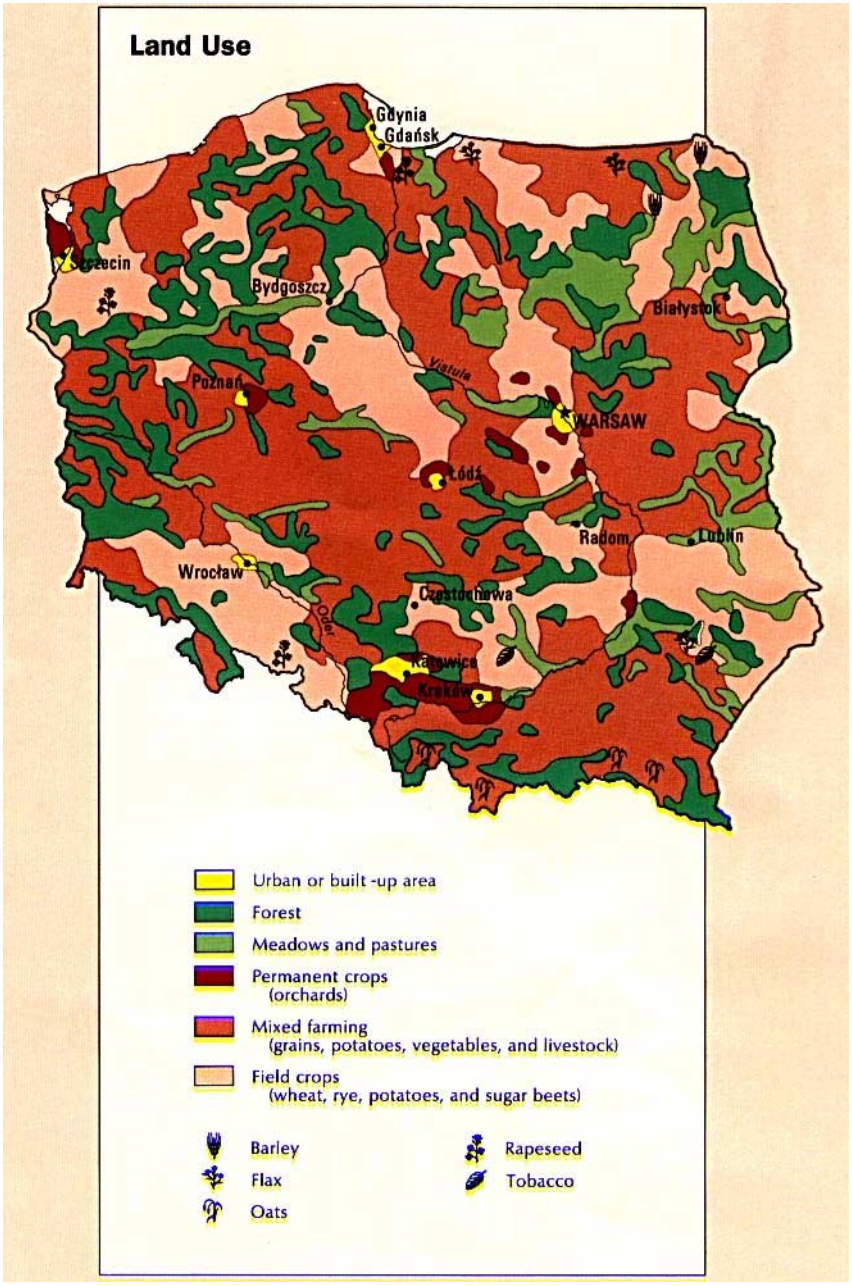
4 CONCLUSIONS

As Sirocco is the world leading firm in wind turbine manufacturing, we are always very interested in developing our activities in new emerging markets. Poland is for us a very important potential market, that s why this proposal requested all our attention.
In one hand, you allow us to be present in a new and key market in the future.
In the other hand, our joint venture would be the opportunity for you to be associated with the world leader in wind energy. And therefore, you would benefit from our strong technical knowledge and expertise in wind energy, as well as an interesting training for your employees with our skilled and experienced technicians.
Moreover, as Poland is a key market for us, we would appreciate to continue our partnership in order to implement future larger wind farms in Poland (offshore ones for example) so that the Sirocco and JPA joint venture would become sooner the leader in wind energy in this country.

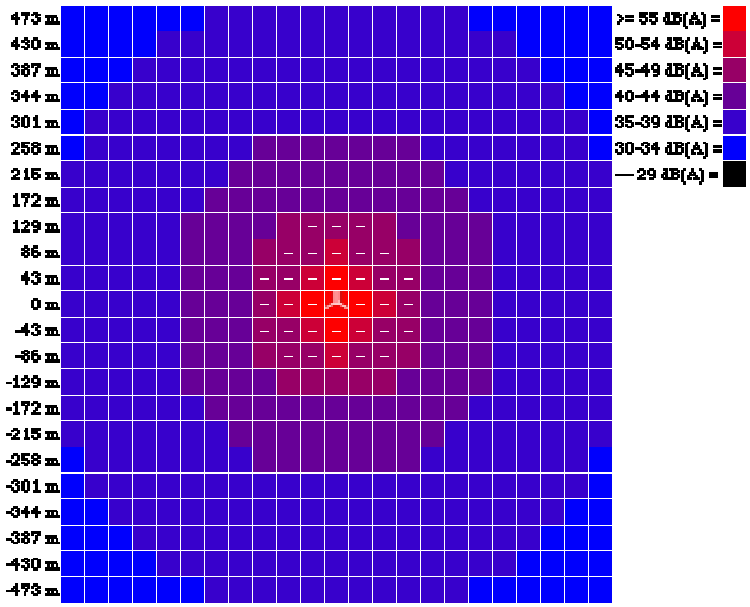
Annexes

Maps

Land use :



Noise :



Legend 1 :

motorways (freeways);

motorways (freeways) under construction, planned;

dual carriageways (two-lane highways)

main roads (highways)

two-way local roads

local roads

road and rail viaducts

other roads

unmetalled roads

main railway (railroad) lines

local railway (railroad) lines


road numbers: motorways (freeways); international roads and national roads


distances in kilometers


navigable waterways

irrigation channels


swamp

sea ferries


river ferries


national borders


border crossings: rail; road; river


woodland

national park boundaries


camp sites; bivouacs


hotels; motels; inns


spot heights; saddles; caves


Orthodox churches; mosques; synagogues;


sea ports; lighthouses; windmills


airports and landing fields


churches of architectural interest; palaces and manors; museums


ski resorts; water sport resorts; equestrian centres


car parks; lorry parks; 24-hour petrol (gas) stations


mountain hostels; youth hostels;


castles; ruins; forts


holiday resorts; spa towns