global wind engineering

CONTENTS

GLOBAL WIND ENGINEERING ID

1. The company.

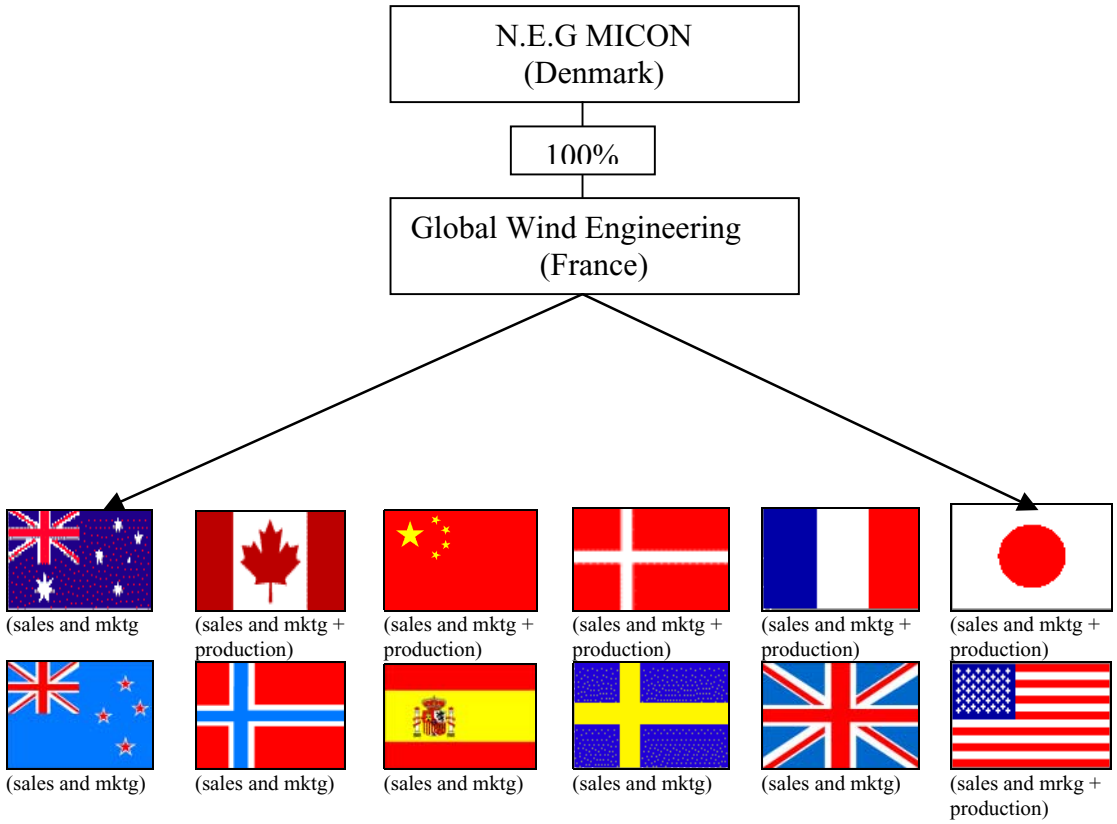
Global Wind Engineering (GWE), created in 1985 is a 100% French subsidiary of NEG MICON, the famous wind turbines manufacturer. We develop, design and build wind-farms of all kinds and sizes for NEG MICON. We are proud to be represented in many countries: Australia, Canada, China, Denmark, France, Japan, New Zealand, Norway, Spain, Sweden, UK, and since 1990 USA

For more than 20 years, GWE has been active in advancing wind power to its current position as a viable industrial alternative to conventional power production. In a fast-growing industry, it has been GWE s ability to build on its project experience in a wide variety of climatic conditions and translate this experience into innovative solutions that has secured the company a position as a leading global supplier of wind energy systems.

GWE and NEG Micon have built up together an impressive track record and gained extensive experience in every facet of wind energy project management: from wind resource assessment, park layout and turbine design to financing, equipment supply, construction, operations, and service and maintenance.

Our wind energy solutions are built on a solid foundation of technical know-how and service and maintenance experience. This know-how is shared with our customers to ensure optimized solutions that respect their technical and financial requirements.

A key asset at GWE is the know-how of the company s employees. Much attention is given to the development of a project culture and cross-organizational communication to ensure that we are always able to provide customers with professional support and advice for their wind energy projects.



Production Lines:
Canada, Denmark, France, USA, China
GWE International Headquarters

1.1. GWE International (SAS)

1, Rue de la Procession, 93217 La Plaine Saint-Denis, France
Phone: +33 149 46 66 66, Fax: +33 149 46 66 80
France

1.2. GWE American Sales and Marketing Office (23 people):

Global Wind Engineering
30, Burton Road
Libertyville
IL 60048, USA

1.3. GWE American Research & Development (46 engineers):

GWE USA, Inc.
Carrier/360 Office Building
2080 N. Highway 360, Suite 140
Grand Prairie, Nevada, USA

1.4. GWE American Production Line (50 workers):

Global Wind Engineering Plant
316, Highway 739, Sloan, Nevada, USA

1.5. Our team in charge of the American joint-venture project :

- Olivier Galland — Corporate Strategy and Institutional Relations
- Caroline Philippe — Technical Expertise
- Arnaud Claou — Corporate Finance
- Nicolas Dumez — Environmental Management
- Emmanuel Leclainche — Marketing Strategy and Communication

1.6. Our company in a few figures:

- Creation : 1985
- Juridical type : incorporated
- Turnover (2000) : 4 497 530 726 USD
- Export (2000) : 3 598 024 581 USD (75%)
- Export Zones : exporting worldwide
- Number of employees :
    - NEG-MICON : 1645
    - GWE : 870

1.7. Quality Certification:

The quality assurance system of GWE is certified according to ISO 9002 and ISO 14000.
Organism : AFAQ
Certificate number : 7242
We also have international and national standard certifications (IEC).

2. Activities in a few lines:

We conceive and produce wind turbines, we maintain, renovate, sell, and build them. Of course we also offer all kinds of associated services (engineer- and technician- training courses, after-sales services).

3. The EPDC-GWE Joint Venture:

3.1. What GWE could provide for this joint-venture?:

site selection
design and engineering studies
tower manufacture
transport on site
engineer training
after-sales services

3.2. What EPDC could provide?:

tower installation on site
development of local personnel to operate and maintain the facility
customer quest
maintenance continuum to service the project
wind farm exploitation

3.3. Connection to grid:

we will negotiate with electricity industry partners like Nevada Power in the case of that joint-venture.

4. Financial Data:

In millions of USD	Dec-00	Dec-99	Dec-98	Evolution from 98 to 00 in %
Turnover	**4 497**	3 247	2 118	112%
Profit before tax	**1 201**	578	349	244%
Net Profit	**756**	364	220	244%
Cash-flow	**560**	248	152	268%
Investments	**74**	58	65	14%
Return (%)	**16,8**	11,01	10,3	63%

Stockholders : N.E.G. MICON (100%)

5. Relevant experience about wind power farms:

GWE and NEG MICON have implemented many off-shore and on-shore wind farms all over the world, some of them in very difficult climatic and topographical conditions.

Location	***Wind-Farm Type***	***Power***
Denmark (Esbjerg)	Coastal line	40 MW
Siberia (Ienisse)	Solid ground	25 MW
Java (Jogjakarta)	Off-shore	35 MW
China (Fou-tcheou)	Off-shore	30 MW
France (Aix en Provence)	Solid ground	15 MW
Canada (Winnipeg)	Solid ground	25 MW

6. Why are we interested in this proposal?

We are the engineering part of NEG MICON, the well-known wind farm manufacturer.
So you will benefit of our know-how and our experience in this domain.
As we already have a subsidiary in US, we have a good experience of the US market regarding wind farms (technical specification, standards, market behavior).

Market study

7. Economic issues

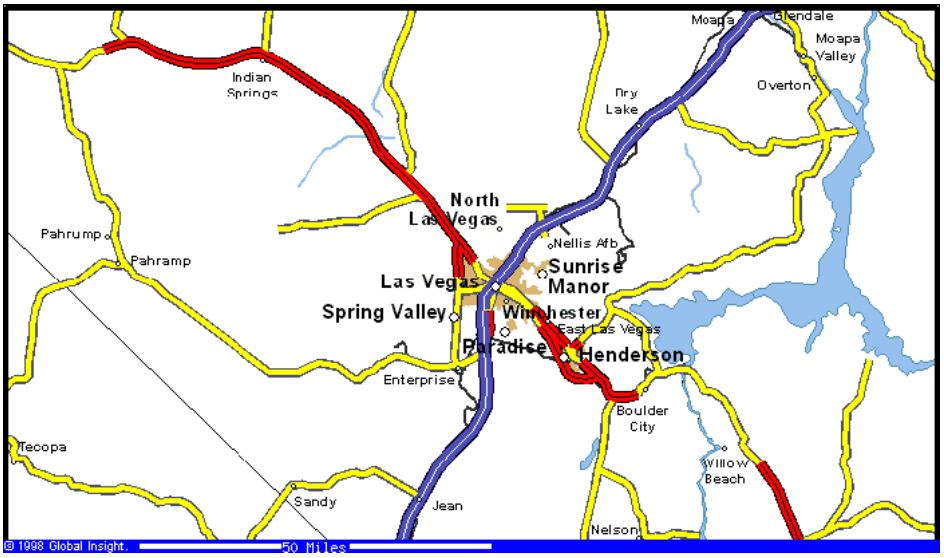
Clark county has fast growing demography and economic activity:
As the local industry is developing, the number of employments is growing (663,000 in 1996 784,000 in 2000). Quality education beginning with the local school districts and enhanced by the University of Nevada, Las Vegas help produce and improve the workforce that supports growing industries in the area.
Additionally, Clark County offers an exciting quality of life with countless entertainment outlets, cultural activities, and recreation including golf and outdoor opportunities with nearby Lake Mead, Red Rock and Mt. Charleston just to name a few.

With a population of more than 1.4 million, Clark County is home to the fastest growing city in the nation (Las Vegas).
The total population has grown from 1000,000 in 1995 to 1400,000 in 2000 and should increase of 400,000 to 2010.

For all these reasons energy supply is raising increasingly.

8. Transit and transportations:

Strong transit and transportations assist the local economy:



Trucking
Las Vegas, located in Clark County, is at the hub of an extensive transportation network on three major highway corridors: Interstate 15, U.S. Highway 95, and U.S. Highway 93.

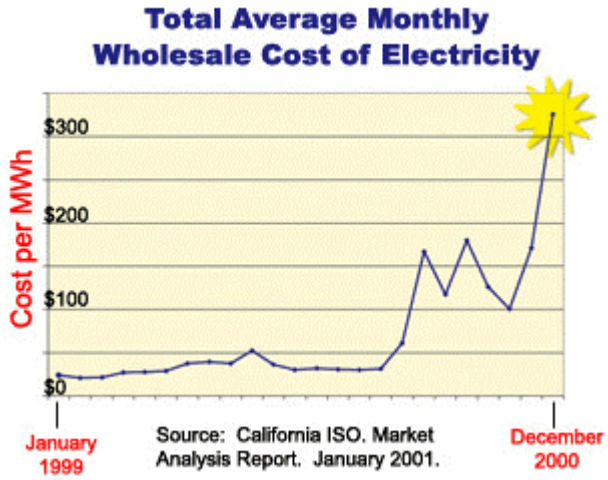
Rail
Southern Nevada's rail service is provided by Union Pacific Railroad. The line runs northeast/southwest through Clark County providing access to several industrial s i t e s .

Airport
McCarran International Airport is located only 5 miles south of Las Vegas, NV. Each day the airport handles approximately 101,002 arriving/departing passengers, 611,270 pounds of arriving/departing cargo, 1,428 aircraft operations, and 3,349 international passengers.

North Las Vegas Airport is a general aviation airport located at the north end of the Las Vegas Valley, just 9 miles from the center of the Las Vegas Strip.

McCarran International Air Cargo Center has evolved into a major air cargo facility. McCarran Air Cargo facilities are capable of handling all aircraft types and its Foreign Trade Zone (FTZ) is attractive to international customers.

9. The sales price



The conjuncture in the Nevada favors the implementation of a wind farm next to Las Vegas.

A lack of power generation and limited supplies of natural gas, coupled with extreme weather cycles and growing populations have driven power prices up and power supplies down. THE RESULT: unprecedented energy costs.

With such a trend the joint venture can expect a sales price of USD400 per MW (i.e. 40cents per KW). This price has to be added to the diverse incentives of the

10. The Joint-Venture customer

The Nevada Power Company is (with 55% market share) the leading electric producer in Clark county but for the last years the production do not supports the supply.

For this reason:
Nevada Power Company and Sierra Pacific Power Company, subsidiaries of Sierra Pacific Resources, have each issued a Request for Proposals (RFP) to solicit proposals for electricity generated from renewable fuel sources. The request is pursuant to Senate Bill 372 and is open to parties who own, propose to develop, or have rights to generating facilities utilizing renewable resources.

This RFP of Nevada Power is an opportunity for the Joint venture to sell the power generated by our wind farm.

The Nevada Power's supply is of 10 MW in 2002 and will reach 30 MW in 2004.

Environmental aspect

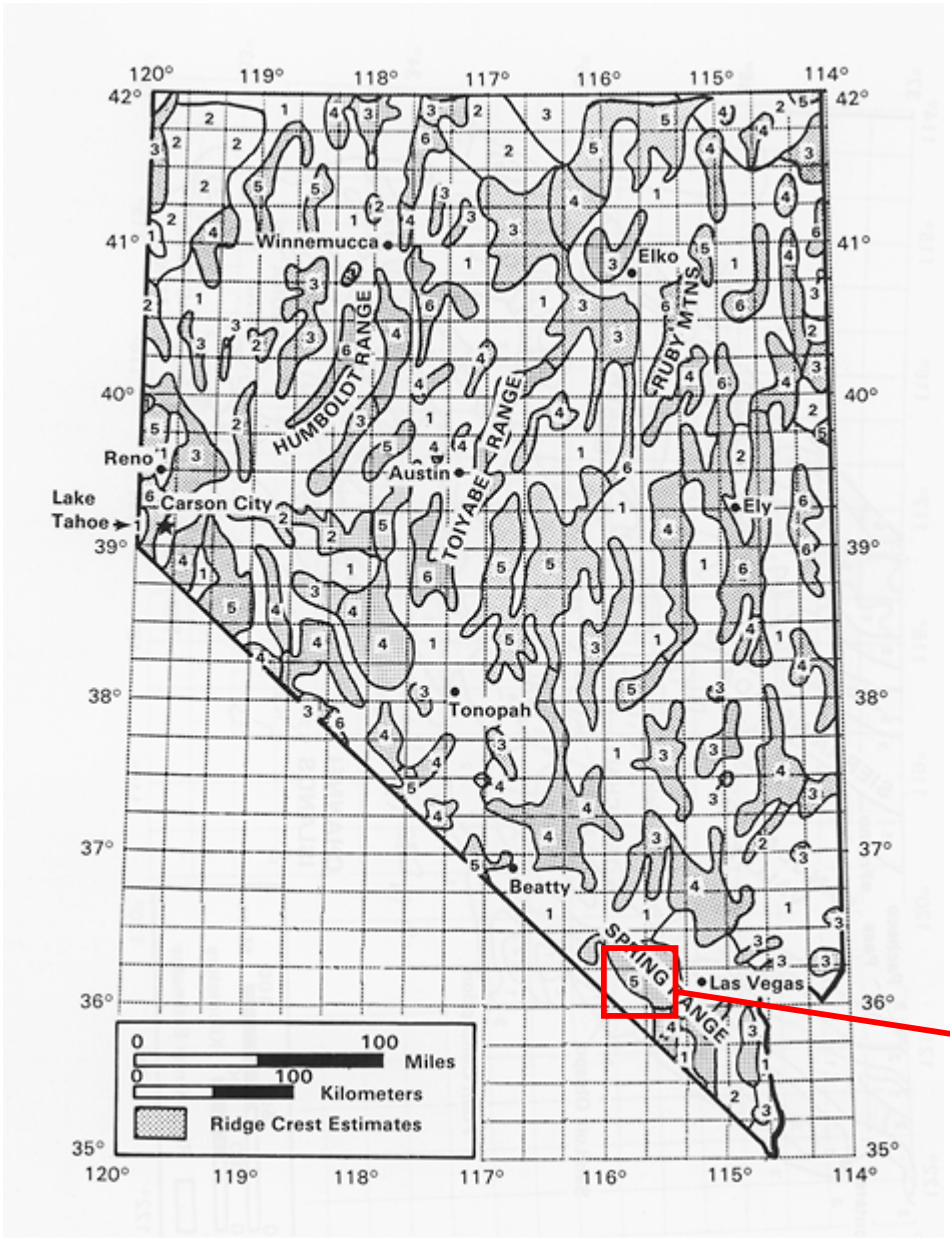
11. Wind energy resource :

11.1. Site choice

The large mountain ranges of the Southwest have a high wind energy resource. The ranges of Nevada are well exposed to the upper-air winds and therefore experience a winter maximum wind power. Where the mountain ranges and ridgelines are oriented perpendicular to the free-air flow, these winds may be further enhanced. Additionally, these ranges are large enough to separate adjacent air basins. The unequal heating of these basins during spring and summer produces air flow over some of these barriers. This flow results in wind speeds that are higher than those that would be found if only the upper-air winds produced the wind resource of the mountains.

Desert conditions are found in most of south eastern California and the valleys of southern Nevada. Intense heating will often generate strong afternoon winds that persist into the evening. The lack of vegetation and the preponderance of broad open valleys in California and narrower valleys in Nevada (which may funnel the winds) allow wind storms to sweep the desert with little abatement. In spite of these mechanisms, most desert floors have only class 1 or 2 power, as wind speeds decrease during the night and morning hours. The numerous mountain summits and ridgelines, which are less subject to stable layers that develop in the valley floors, may experience wind power of class 3 and higher. The lower mountains and ridges of southern California and southern Nevada, being more strongly affected by the thermal circulation, experience a spring maximum.

A suitable site near Las Vegas for Global Wind Engineering is the Spring Range area. The most interesting wind conditions (wind power of class 5) are located to the west of Las Vegas, Clark (36.2N ; -115.7 W). In the city or in the downtown, wind power is not strong enough.



Suitable site area for wind farm

11.2. Technical estimating :

In the Southwest region, considerable surface wind data from mountain summits and ridge crests were available for verifying the estimates based on upper-air wind data. Particularly over some of the mountainous areas of the Southwest, applying the free-air winds often results in gross errors, especially during the warm season. Upper-air winds over the Southwest are extremely weak during the warm season, yet surface winds on many of the mountains are frequently strong due to the presence of thermally produced circulations of a mesoscale (monsoonal sea-breeze) and/or toposcale (surface slope heating) nature. The free-air technique would, for example, predict a mean power density of 15 to 25 W/m^2 over a mountain range with a true representative power density of 300+ W/m^2. The discrepancy is due to the presence of a modified sea-breeze flow into the desert. Mountain summit estimates were adjusted accordingly during the spring, summer, and fall when substantial fire weather data were available. Winter estimates closely followed the free-air technique,

as thermal effects are greatly reduced in the cold season and synoptic effects are increased.

The place who was chosen is not an urban one so the visual impact is not very important.

The resonant broadcasts do not constitute a major problem for the wind industry because of the regimentation setting up, fixing a minimal distance to the nearest neighbors (these correspondent often to about 7 diameters of rotor)

Birds and Other Living Resources˚:

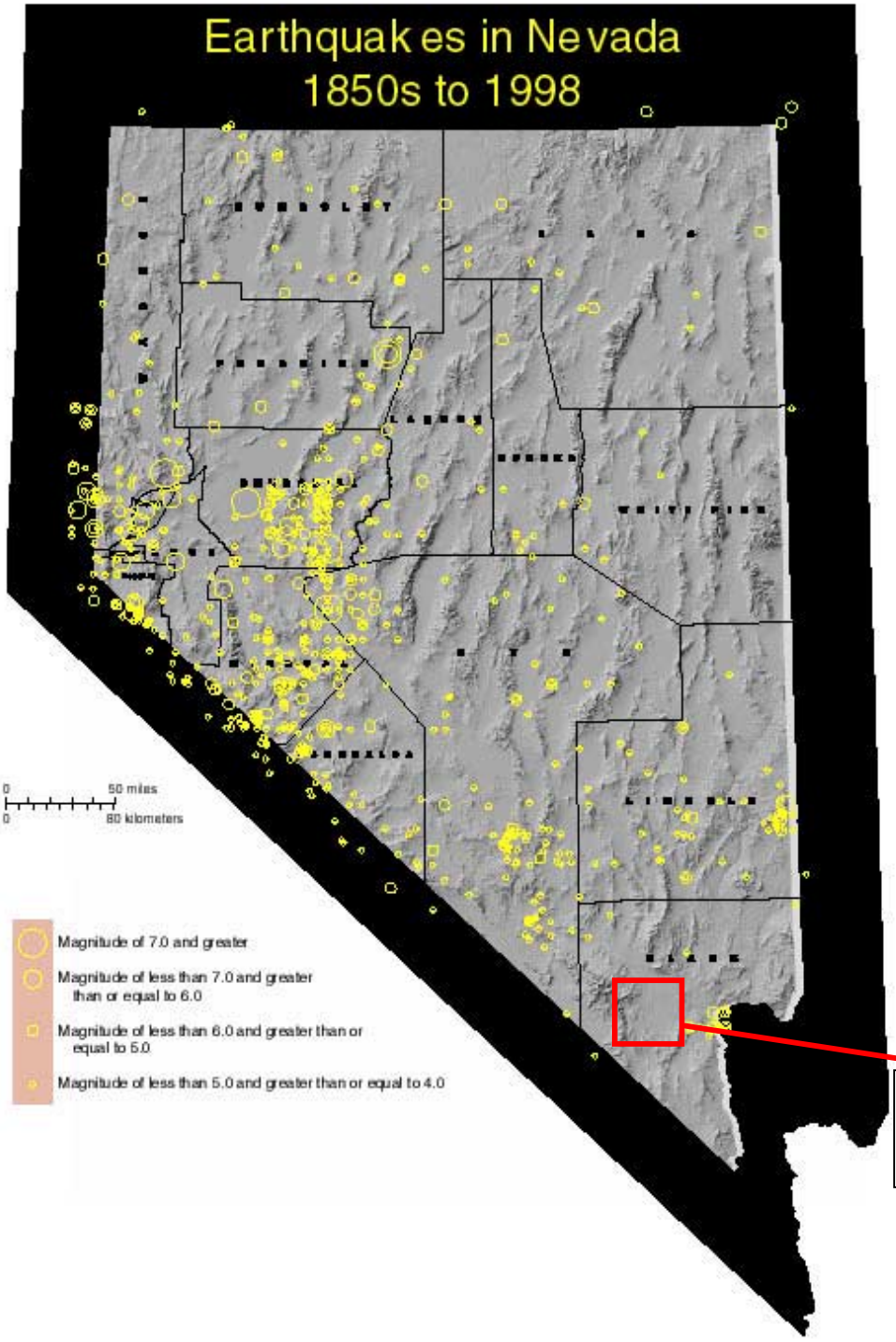
It is rare that the presence of wind turbines embarrasses birds. Studies (Denmark, Tjaereborg) revealed that birds have the tendency to change their road of flight a few 100 to 200 meters before arriving to a wind turbine in order to pass over to this one of to a sure distance. One of our studies shows that actually that high tension lines constitute a danger well more important than the wind turbines.

Studies achieved to the Yukon (Canada) show that the migratory birds don't enter in collision with the wind turbines. Besides the suitable site is not on the migratory roads of birds.

Recent technology advances have reduced the risk to migratory birds by increasing the size and visibility of the blades, slowing the speed of rotation and using tubular towers with international ladders and underground wiring to eliminate roosting and nesting sites on the structure itself.

Earthquake risk :

There are risk over class 4 in Las Vegas but not for our proposed site.


Earthquakes in Nevada
1850s to 1998
0
50 miles
0
80 kilometers
Magnitude of 7.0 and greater
Magnitude of less than 7.0 and greater than or equal to 6.0
Magnitude of less than 6.0 and greater than or equal to 5.0
Magnitude of less than 5.0 and greater than or equal to 4.0
Suitable site area for wind farm

Technical PART

12. TECHNICAL SOLUTION

12.1. Material selection

12.1.1. Product presentation

We have chosen to offer you a new specific material type of our range (ref: **GW-2000/100**). This product is a pitch-regulated turbine with three blades and an 80-metre rotor diameter. The revolution speed of the rotor varies between 9 and 19 rpm, and it is this flexibility that makes it ideal for placement in our chosen area.

The **GW-2000/100** turbine is equipped with an innovating system (*Global Optimum®*) that allows the turbine blades to rotate at varying speeds. With this new system, the revolution speed can now vary by up to approx. 60%.
It is an efficient solution because the converter only transforms the energy from the generator rotor, which is only a small part of the total energy generated by the system. The energy generated by the generator rotor is converted back into electricity suitable for the grid by the converter.

Thanks to the converter, the standard setting of the turbine prevents it from receiving reactive output from the electricity output, if required.

In short: *Global Optimum®* optimizes energy production and makes it easy to adapt the operation of the turbine to suit the parameters of the electricity grid, no matter how much the requirements from the electricity companies may vary.

Sounds levels are still of crucial importance when deciding on the placement of wind turbines in populous island areas. Thanks to the high revolution speed of the GW-2000/100 turbine in strong wind speeds Global Wind Engineering has taken yet another important step towards fulfilling requirements for a wind power solution with a low sound level. The GW-2000/100 turbine also makes it possible to program the turbine sound levels before installation, so the operation of the turbine is tailor-made for the specific requirements of the chosen location.

Naturally, the new turbines are equipped with *Global Lightning Protection®* , which protects the entire turbine from the tips of the blades to the foundations.

12.1.2. Why did we choose GW-2000/100?

Profitability

- Our experience showed us that for wind farm of this power class, large wind turbines give a better profitability than smaller ones**.**
- This kind of turbines is specially adapted to area with high winds
- Moreover at this height of hub (100 m) we are sure to get the most wind.

Economy

- **Long-dated economy:** large wind turbines enable the same amount of energy to be produced with fewer wind turbines, so the maintenance operations will be done on a low number of turbines. Therefore maintenance costs will be relatively low.
- **Economies of scale:** larger machines are usually able to deliver electricity at a lower cost than smaller machines. The reason is that the cost of foundations, road building, electrical grid connection, plus a number of components in the turbine (the electronic control system etc.), are somewhat independent of the size of the machine.

Aesthetic

- From an aesthetic view point, large wind turbines˚integrate often better in the landscape, because they generally have lower rotational speed than smaller turbines. Large turbines therefore do not attract the eye the way fast-moving objects generally do because their rotation speed is lower so that they normally less attract the eyes than objects moving in high speed.
- Moreover tubular steel towers are known to create also a better integration in landscape.

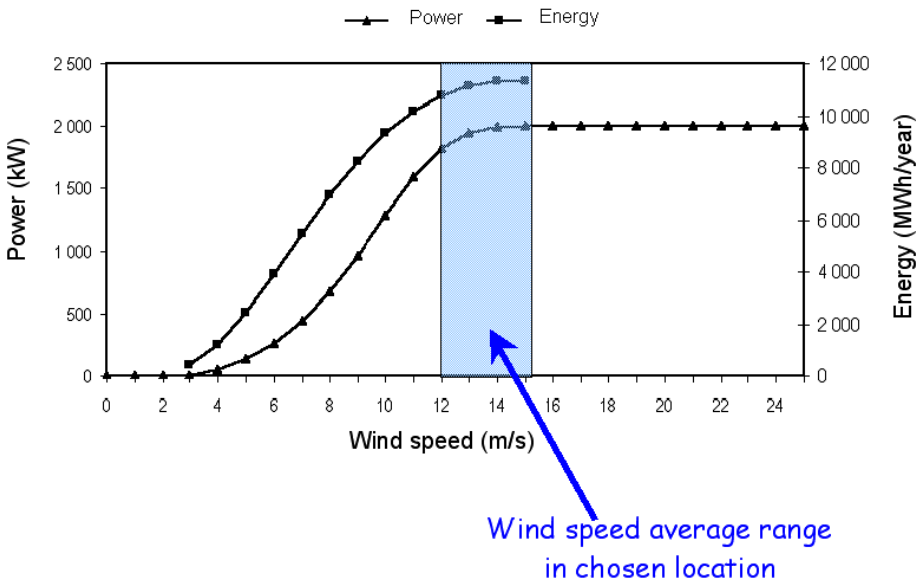
Security

Better security for maintenance: the GW-2000/100 is provided with the **fall protection devices.**

12.1.3. Technical specifications

Rated Output	2MW per tower
Annual Output	83264 megawatt hours per year
Turbine Design	Horizontal axis
Tower Structure	Tubular steel
Height	100m
Number of blades	3
Blade Length	34m
Weight	315t
Rotor Diameter	80m
Rotor Speed	16,7rpm
Swept Area	5,027m_
Gearbox Type	3-step planetary gear system
Cut-in wind speed	4m/s
Nominal wind speed (2MW)	15m/s
Stop wind speed	25m/s
Generator Type	Asynchronous with Global Optimum
Braking Systems	Equipped with electromechanical pitch control for each blade.
Yaw System	Planetary gears driven by an electronic sensor which check the wind vane position.
Control System	Microprocessor-based control of all the turbine functions with the option of remote monitoring
Lightning Protection System	Turbines are equipped with *Global Lightning Protection* , which protects the entire turbine from the tips of the blades to the foundations
Sound Proofing	Sound levels is reduced by a specific design of tower, gearbox and blades in accordance with the chosen location
Certification	IEC Class II for a 30-year fatigue life

Energy and power graph according to our chosen site



The Electronic Wind Turbine Controller

The wind turbine controller consists of a number of computers which continuously monitor the condition of the wind turbine and collect statistics on its operation. As the name implies, the controller also controls a large number of switches, hydraulic pumps, valves, and motors within the wind turbine. As wind turbine sizes increase to megawatt machines, it becomes even more important that they have a high availability rate, i.e. that they function reliably all the time.

Communicating with the Outside World

The controller communicates with the owner or operator of the wind turbine via a communications link, e.g. sending alarms or requests for service over the telephone or a radio link. It is also possible to call the wind turbine to collect statistics, and check its present status. In wind parks one of the turbines will usually be equipped with a PC from which it is possible to control and collect data from the rest of the wind turbines in the park. This PC can be called over a telephone line or a radio link.

Internal Communications

There is usually a controller both at the bottom of the tower and in the nacelle. On recent wind turbine models, the communication between the controllers is usually done using fiber optics. There is a third controller placed in the hub of the rotor. That unit usually communicates with the nacelle unit using serial communications through a cable connected with slip rings and brushes on the main shaft.

Fail Safe Mechanisms and Redundancy

Computers and sensors are usually duplicated (redundant) in all safety or operation sensitive areas of newer, large machines. The controller continuously compares the readings from measurements throughout the wind turbine to ensure that both the sensors and the computers themselves are OK. The picture at the top of the page shows the controller of a megawatt machine, and has two central computers. (We removed the cover on one of the two computers to show the electronics).

Control Strategies

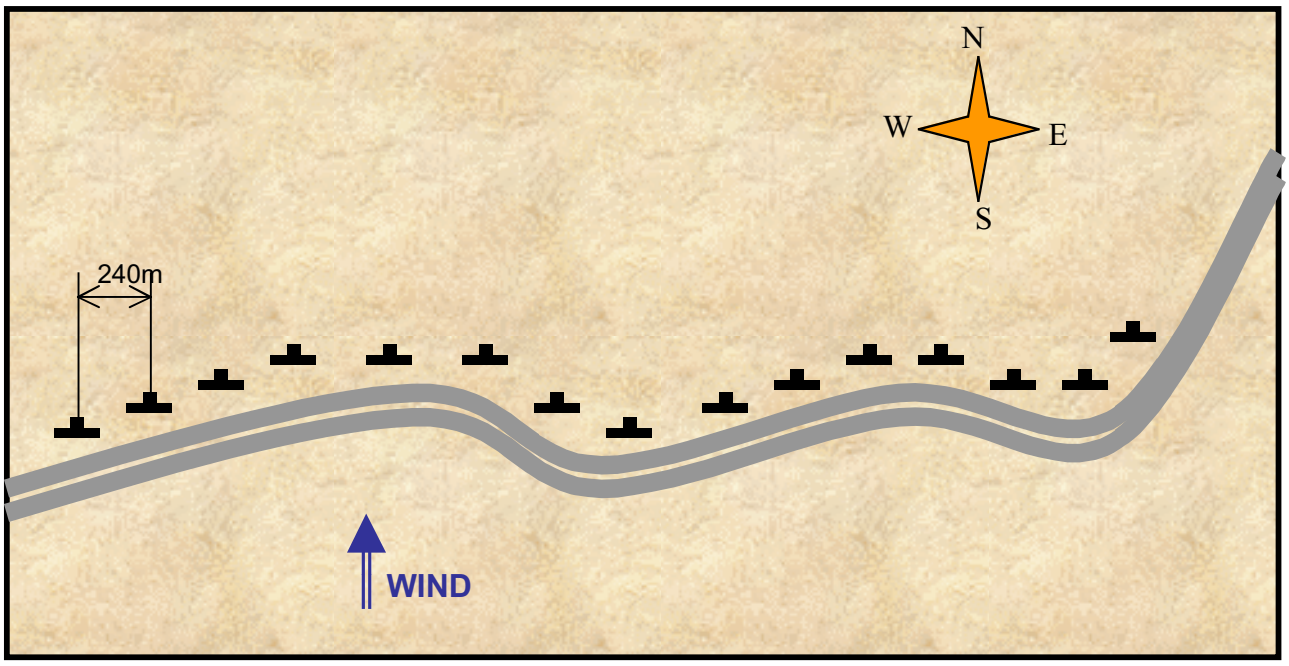
Many of the business secrets of the wind turbine manufacturers are to be found in the way the controller interacts with the wind turbine components. Improved control strategies are responsible for an important part of the increase in wind turbine productivity in recent years. An interesting strategy pursued by some manufacturers is to adapt the operational strategy to the local wind climate. In this way it may e.g. be possible to minimize uneconomic tear and wear on the machine during (rare) periods of rough weather.

12.2. Wind farm implantation proposition

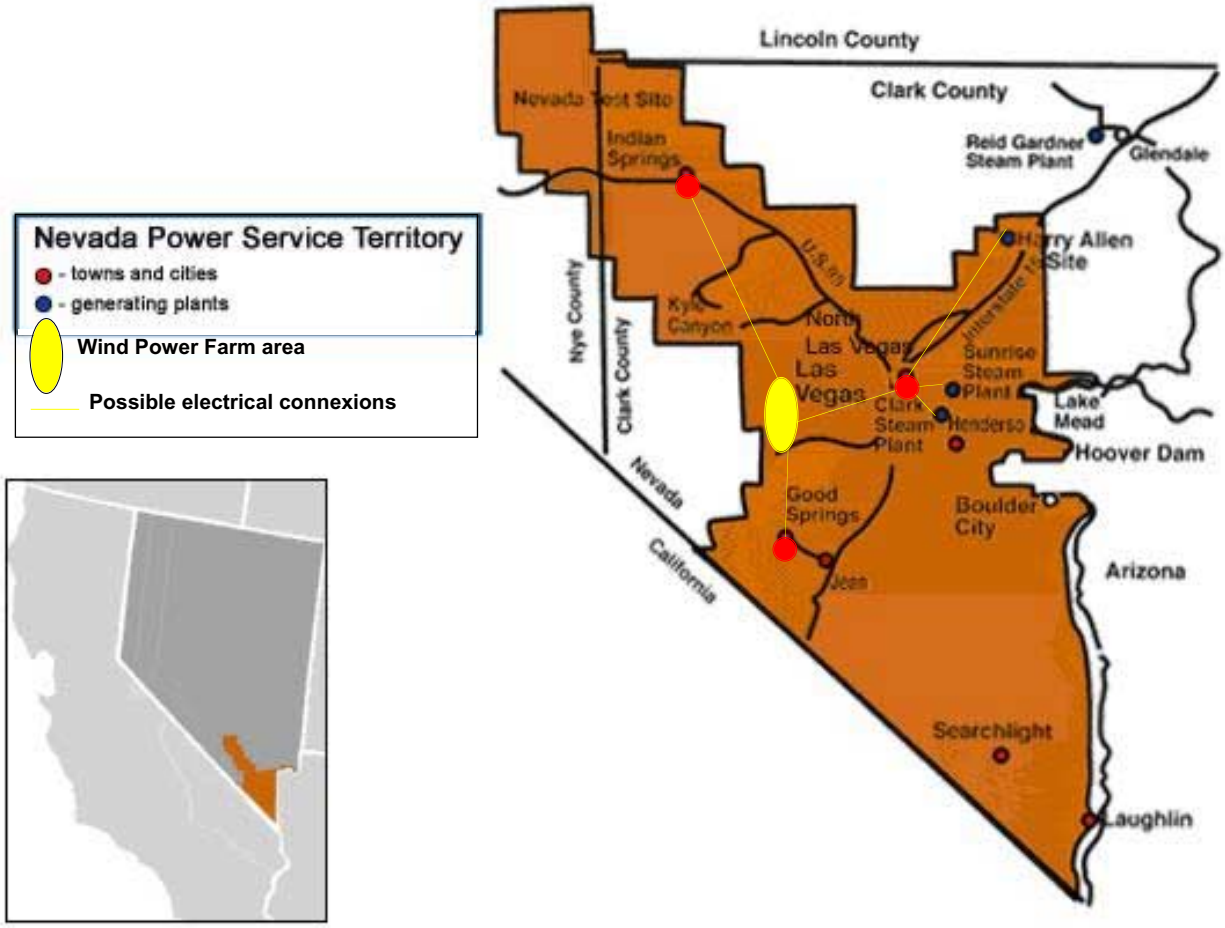
Our engineers decided to arrange the wind turbines all along an existing road in order to improve the global aspect of the wind farm. We will see later that this disposition could be better for a scenic implantation. This picture on the left, allows to imagine a little more how the implantation could look like. You can also visualize the schematic drawing of the wind farm along the road hereunder.

The park will be constituted of 15 wind turbines of 2MW each. So that we obtain a total power of 30 MW

As a rule, turbines in wind parks are usually spaced somewhere between 5 and 9 rotor diameters apart in the prevailing wind direction, and between 3 and 5 diameters apart in the direction perpendicular to the prevailing winds.



12.3. Connection to electrical line



12.4. Scheduling

	1rst month		2nd month		3rd month		4th month		5th month		6th month		7th month		8th month		9th month	
location study																		
wind turbines manufacturing																		
foundation preparation																		
wind turbines installation on site																		
Electrical equipement installation																		
connection to electrical line																		
Experimentation																		

The implantation of the wind farm will last about 9 months. A good organization between the different stages will allow us to overlap several steps of the project in order to reduce the construction time.

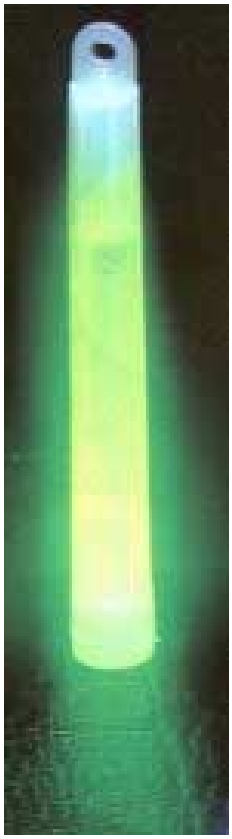
12.5. Innovative solution.

_Why did we mind to this innovating solution?

- Firstly for the **site location**, because Las Vegas has in the entire world a lightning image. Our idea is to associate a clean aspect with Las Vegas and, in time, giving a new boom to the wind power. Indeed, in associating wind power with Las Vegas and this innovating solution, we can benefit of a world acknowledgment.
- Secondly, this implantation can be the beginning of other ones (for example: golf, attractions). It can also attract the attention on environmental problems and solutions that are available nowadays (economical repercussions).
- Finally, simply for esthetics reasons.

_Why this product?

This product is able to restore solar energy during the night without exterior power.



Product definition:

Energy can be transferred into (and out of) matter in many different ways, as heat, light, or by chemical reactions. When energy is released by matter in the form of light it is referred to as luminescence. An exception is usually made for matter that has such a high temperature that it simply glows; this is called incandescence.

- When energy in the form of light is released from matter because of a chemical reaction the process is called **chemiluminescence**. One example of a common chemiluminescent reaction is a flame, where the reaction between a fuel and an oxidant produce excited state products that emit light; however, as an example of chemiluminescence this process is complicated by the fact that incandescent particles are often also present because of the amount of heat released by the reaction; therefore, some (or most?) of the light in common flame comes from very hot incandescent emissions.

A better example of a chemiluminescent reaction is between nitrogen monoxide (symbol NO) and ozone (O_3). This reaction is routinely used to determine either ozone (using excess NO) or NO (using excess O_3).

The reaction is shown in the following equations:

$$NO + O_3 \longrightarrow NO_2^* + O_2$$

$$NO_2^* \longrightarrow NO_2 + light$$

Nitrogen monoxide reacts with ozone to produce nitrogen dioxide (NO_2) in an excited state (denoted by the raised asterisk). Little of the excess energy involved in this process is released as heat; therefore, the reaction mixture and products do NOT incandesce to any significant degree. The reaction produces an excited state NO_2 which returns to a lower energy state by (**in part**) releasing photons of light: chemiluminescence. This electromagnetic radiation has a range of wavelengths; however, the emission is centered around 1200 manometers (nm).

*The conditional words **in part** are included in the last paragraph because there is actually two ways excited state NO_2 can de-excite. One is via photon emission (chemiluminescence); another is by losing energy through collisions with other particles. This collisional process becomes more and more significant as the amount of particles available for collisions increases. In the gas phase, higher pressure means higher collision rate. This is why most gas phase chemiluminescence reactions are performed at low pressures; this increases the amount of energy released via photon emission by decreasing the amount of collisional deactivation.*

- **Design**

We decided to integrate Luminol only on blades. By night, we will see circular luminescent effects in the sky. This product has 20 years life-time in usual conditions. This painting is achieved during the blades manufacturing. Luminol is available in a large range of colors.

On this picture we have represented in red the parts that could be painted. It s only an example of what could be done as there are lots of possibilities.

_Marketing study

A market study showed us that 70% of the population living around will agree with this new wind farms generation. Indeed, the lighting emission is high but it won t disturb anybody: the first inhabitants are living too far away.

The lighting emission is high but it won t disturb anybody: the first inhabitants are living too far away.

13. The services

SERVICE AGREEMENTS

You need to keep your power system at maximum efficiency, and to control your maintenance coasts. GWE can help you, through a choice of service agreements tailored to your needs, your environment and your equipment.

- ***The guarantee of a total security:*** GWE service agreements keep your equipment in top conditions to respond at any time to a mains power failure.
- ***Control your maintenance costs***: with GWE service agreements you can more easily manage your maintenance budget for your GWE power systems. Working together, we will schedule the service visits according to your maintenance program so that continuous operation of your installation will be ensured.
- ***Benefit from other advantages*** available only through our service agreements: you can take advantage of our preferential rates on spare parts, and repair visits to your GWE systems are always taken as a priority.
- ***The quality that you require***: our field engineers operate worldwide and their skills and know-how are always at your disposal for advice, comment and training.

Several levels of service agreements are available to you: Silver, platinum. With all of the above agreements, you benefit from the following:

- A preventive maintenance visit during which our engineers check all necessary parameters: physical environment, electrical environment, checking of the command and signaling units.
- A guaranteed response time.

Our service agreements can also be tailored if you have specific needs. Please do not hesitate to discuss this with our GWE service advisors.

PRE-PROJECT ADVICE

GWE is able to provide you with advice and analysis services in accordance with your needs, in order to give your installations the power most suited to your requirements.

- ***Benefit from the GWH experience***.
- ***Take advice from our technical experts.***
- ***Take advantage of our fast, free of charge quotation answering service.***
- ***The quality that you require.***

COMMISSIONING

GWE is able to work alongside you to start up your power system more quickly and efficiently. Our technical support tem makes sure the commissioning of your system is performed under the best conditions, thus guaranteeing the power level you need. Together, we optimize your systems but also of your staff.

TELEPHONE HOTLINE

For answers to all your questions on how to use and maintain your power systems, GWE has established a technical support hotline, staffed by its qualified engineers. They are there to help you to resolve systems malfunctions and provide in real-time.

SPARE PARTS

In order to help you to choose the parts most suited to your system and to propose the best delivery time at the lowest price, the GWE spare parts team is ready to work with you. We guarantee compatibility of our spare parts with your industrial equipment.

TRAINING

In order to optimize the use of your power system, we can put at your disposal a qualified training engineer from our registered GWE Training Center.
Several training programs are available to you, allowing your staff to receive a professional qualification in the use and maintenance o your system.

Financial part

14. Cost analysis

Initial Costs in USD	Unit	Quantity	Unit Cost	Amount
Feasibility Study				
Site investigation	p-d	20	$ 1 800	$ 36 000
Wind resource assessment	met tower	30	$ 1 800	$ 54 000
Environmental assessment	p-d	20	$ 800	$ 16 000
Project management	p-d	30	$ 800	$ 24 000
Market study	Cost	30	$ 800	$ 24 000
Sub-total:				**$ 154 000**
Engineering/construction				
Wind turbine(s)	kW	30 000	$ 1 000	$30 000 000
Mechanical/electrical design	p-d	70	$ 2 000	$ 140 000
Sub-total:				**$30 140 000**
Equipment				
Transportation	turbine	15	$ 60 000	$ 900 000
Wind turbine(s) foundation(s)	turbine	15	$ 150 000	$ 2 250 000
Wind turbine(s) erection	turbine	15	$ 100 000	$ 1 500 000
Road construction	km	10,00	$ 50 000	$ 500 000
Transmission line and substation	project	1	$ 3 000 000	$ 3 000 000
building(s)	building	2	$ 100 000	$ 200 000
Transportation	project	0	$ 70 000	$ -
Sub-total:				**$ 8 350 000**
Other costs				
Training	p-d	80	$ 800	$ 64 000
administrative costs	p-d	100	$ 800	$ 80 000
Interest during construction	%	6,0%	$38 644 000	$ 2 318 640
Contingencies	%	5%	$38 644 000	$ 1 932 200
Sub-total:				**$ 4 394 840**
Initial Costs - Total				**$43 038 840**

(p-d)= person per day

15. Feasibility costs

Once the pre-feasibility analysis has been made (in the first pages), a more detailed feasibility analysis study is required. Feasibility study include items as
-site investigations, a wind resource assessment, an environmental assessment which require to send engineers.
-a market study made by marketing and commercial specialists.
-a project manager

For a large wind farm, the feasibility study cost often exceed 1 % of the total wind energy project cost. But GWE with it s experience manages to reduce this down to 0,5%.

16. Engineering and Equipment

This includes the manufacturing cost of our wind mills, which is variable to the power generated.
The design cost which cover all the research and development charges for this type of turbines.
The erection, transportation, and foundations, which costs depends on the site we have selected.

Other costs:
-As we have experienced for a long time most project meet contingencies that we estimate at 5% of the initial costs.
-Administrative costs cover charges bound to the project : flying tickets, hotel rooms, telephone facture This cost is estimated in price per person.
-As it was asked in RFP a special training of local worker is necessary. This training requires good workers of GWE and their competencies.
-A debt should be contracted in order to finance 30% of the project. Interest during construction vary depending on the duration of construction. This project in Nevada should take 9 months (see technical part), and the price of money per year is 8% high. Therefore during the project interests will be of 6%.

Annual Costs	Unit	Quantity	Unit Cost	Amount
maintenance				
Land lease	%	2,0%	$ 4 163 179	$ 83 264
Insurance premium	%	3,0%	$ 4 163 179	$ 124 895
Transmission line maintenance	%	5,0%	$ 3 000 000	$ 150 000
Parts and labor	kWh	83 263 579	$ 0,008	$ 666 109
General and administrative	%	10%	$ 1 024 268	$ 102 427
Contingencies	%	10%	$ 1 024 268	$ 102 427
Annual Costs - Total				**$ 1 229 121**

We have made an estimate of the costs that maintenance implies.
Land lease: The land owner requires a 2% compensation for use of the land that is priced at $4163000.
The insurance is compulsory.
T-Line maintenance is 5% of the turbines cost. Labor should cost 8cents per KW.
General and administrative.
Contingencies depend on meteorology/climatic conditions

Periodic Costs		Period	Unit Cost	Amount
Drive train	Cost	10 yr	$ 1 000 000	**$ 1 000 000**
Blades	Cost	40 yr	$ 2 900 000	**$ 2 900 000**

During this project the drive train will be changed twice but the blades which are specially engineered by GWE are reliable for 40 years.

17. Financial analysis

Financial Parameters		
Renewable energy delivered	MW	83 264
Revenue of energy	$/KW	0,0400
RE production credit incentives	$/KW	0,010
Inflation	%	2,0%
Discount rate	%	12,0%
Project life	yr	25
Debt ratio	%	30,0%
interest rate	%	8,0%

This table summary all factors that will have an influence on the project reliability.

Things to be underlined:

The Nevada Power Company will allow 40 cents /KW (see the market study)

The Clark County pays an incentive of 10 cents /KW for renewable energies.

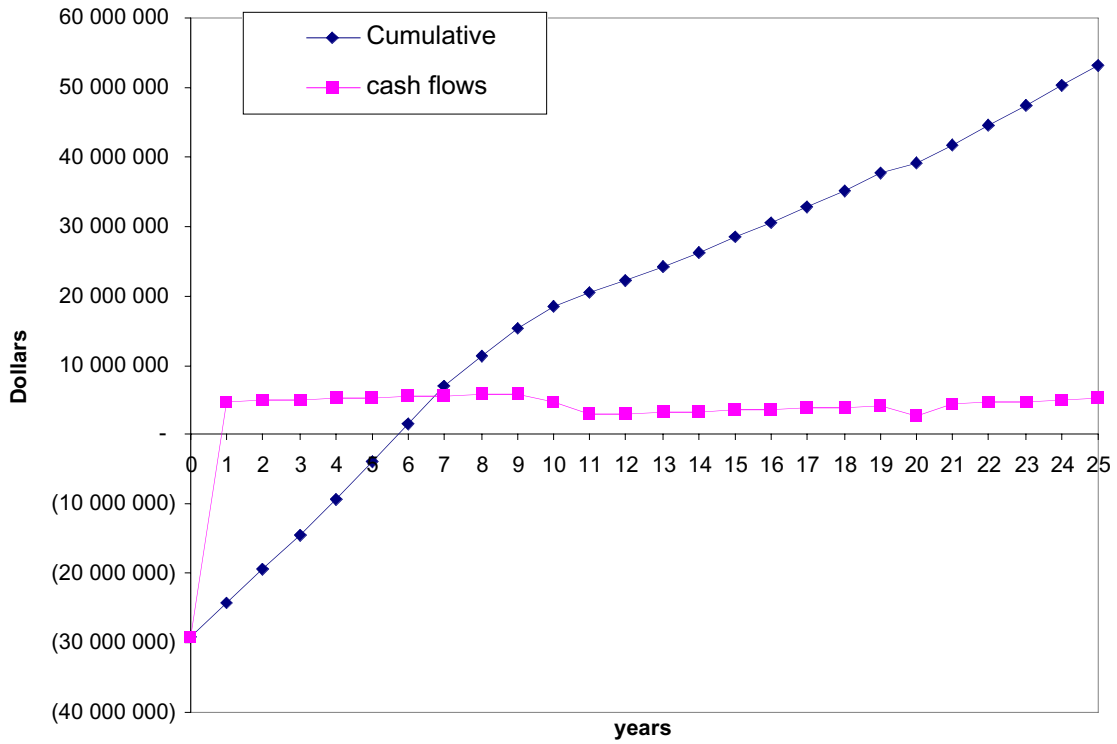
Project Costs and Savings				
Initial Costs				
	Feasibility study	0,4%	$	154 000
	RE equipment	71,8%	$	31 040 000
	implementation	17,3%	$	7 450 000
	other costs	10,2%	$	4 394 840
Initial Costs — Total		100,0%	**$**	**43 038 840**
Grants			$	1 000 000
Annual Costs and Debt				
	maintenance		$	1 229 121
	debt payment		$	1 209 548
Annual Costs - Total			**$**	**2 438 669**
Annual Savings or Income				
	Energy income + incentives		$	**5 412 133**

Costs have already been analyzed but:

an incentive reaching $1 000 000 is granted by Nevada State.

Cash Flow Analysis

	Year	cash flows	cumulative		
	#	USD		USD	
0	(29 127 188)	(29 127 188)	13	3 209 864	24 236 482
1	4 762 045	(24 365 143)	14	3 350 918	26 281 492
2	4 888 625	(19 476 519)	15	3 496 416	28 397 118
3	5 018 570	(14 457 948)	16	3 646 495	30 588 414
4	5 151 982	(9 305 966)	17	3 801 300	32 859 497
5	5 288 960	(4 017 007)	18	3 960 976	35 213 823
6	5 429 611	1 412 604	19	4 125 677	37 654 385
7	5 574 042	6 986 647	20	2 656 942	39 118 741
8	5 722 366	11 427 720	21	4 470 782	41 739 515
9	5 874 698	15 340 270	22	4 651 514	44 453 849
10	4 751 071	18 450 785	23	4 837 926	47 263 852
11	2 940 552	20 330 811	24	5 030 195	50 171 521
12	3 073 119	22 255 693	25	5 228 503	53 180 373



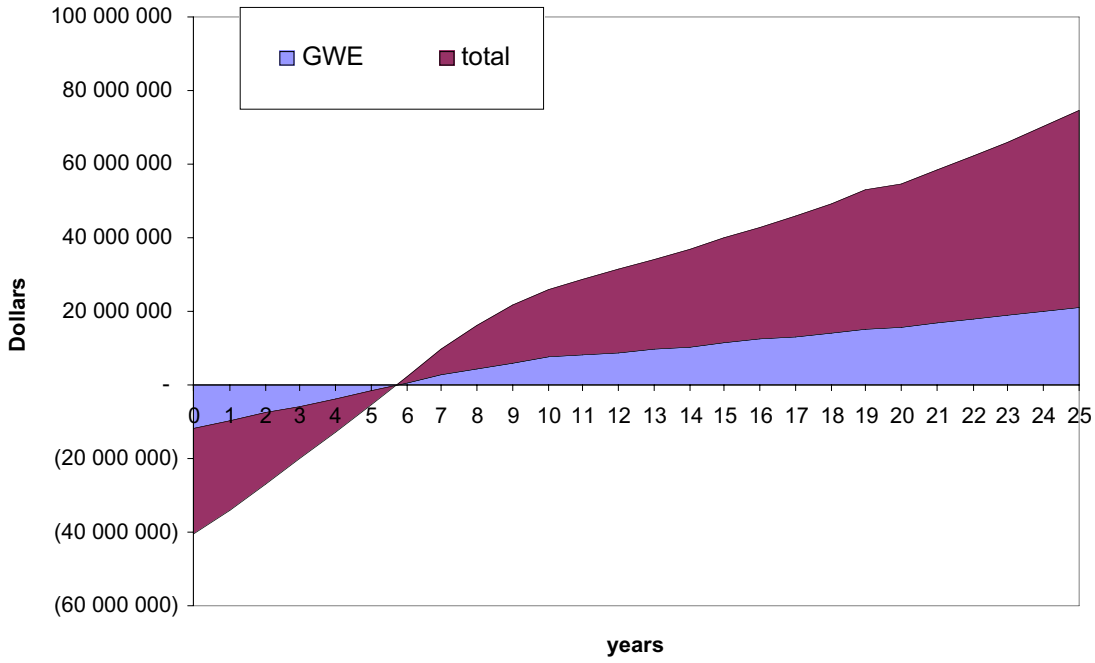
The cumulated cash flow curve shows that the project is reliable before the 6th year.

The annual cash flow curve shows the maintenance investments that are necessary in the 10th and the 20th years.

Financial Feasibility		
Pre-tax IRR and ROI	%	16,1%
After-tax IRR and ROI	%	13,9%
Simple Payback	yr	7,2
Year-to-positive cash flow	yr	5,7
Net Present Value - NPV	$	3113304
Annual Life Cycle Savings	$	396000
Profitability Index - PI	-	0,1
Project equity	$	30 127 188
Project debt	$	12911000

With such an IRR the project seems to be very remarkable, and the ratio debt on equity does not exceed 40% what seems to be secured.

The total of costs and investments would be supported at 40% by GWE and the return on assets will be in the same proportion.



18. Final Cost Analysis Proposal after Negociation :

- We are able to reduce the feasibility study cost by reducing the number of persons working on it.

Feasibility study	Unit	Quantity	Unit Cost (USD)	Amount (USD)
Site investigation	p-d	7	1 800	12 600
Wind resource assessment	met tower	15	1 800	27 000
Environmental assessment	p-d	5	800	4 000
Project management	p-d	8	800	6 400
Market study	Cost	10	800	8 000
Sub-total				**58 000**

- We offer you a discount on Wind turbines price (we sell them at cost price) and on Design price (the systems on wind turbines have already been studied in part).

Theme	Previous Amount (USD)	New Amount
Mechanical/Electrical Design	140 000	**50 000**
Wind Turbines	30 000 000	**25 000 000**

- In the precedent study, we didn t include subsidies: we have a subsidy from the Nevada State, and another one from Las Vegas who was really interested by the tourist aspect of the project.

Subsidy (USD, not included in first proposal)		TOTAL (USD)
State	1 000 000	**2 500 000**
Las Vegas	1 500 000	

Finally all these modifications allow reducing the project cost:

New Cost (Included Subsidies and discount)		
Previous cost	Subsidies and discount	New amount
43 038 840	-96 000	**35 352 840**
	-90 000	
	-5 000 000	
	-2 500 000	