行政院及所屬各機出國報告

(出國類別： 洽公)

赴歐洲洽商台電麥寮案風機返國報告

服務機關：漢翔公司

出國人職稱：組長/處長/組長/處長/管理師

姓名：黃榮次/李龍鑫/羅明賓/羅清溪/張玉女

出國地區：德國/丹麥/西班牙

出國期間：95.08.12-95.08.25

報告日期：95.09.07

壹、摘要

本公司承包台電「參寮風力發電機組新建工程」，原規劃之風機廠商西班牙 Gamesa 公司，因國際能源價格飛漲，造成風機搶購熱潮，致本公司擬採購之風機必須排至 2009 年才能交貨，無法滿足台電合約需求，將面臨違約罰款等重大損失。

為加速參寮案風機採購之進行，特規劃前往歐洲，直接與 Gamesa 公司協調風機提前交貨之可能性，並確認風機交期及價格。同時另前往德國、丹麥及西班牙等國訪問其他風機製造商，瞭解相關機組之可能交期、價格及 ICP 意願等市場情況，考量建立第二商源，以期降低參寮案執行風險，維護公司最大利益。。

貳、目次

參、拜會廠家及小組提報摘要

European Wind Turbine Manufacturers Visiting Schedule

7/28/06

Date	Company	Airport / Location	Contact / Address	Model /Spec		Topics
2006/8/14 (Monday)	Nordex	Hamburg, Germany 德國 漢堡	Mr. Karsten Brueggemann International Sales Nordex Energy GmbH Bornbarch 2, 22848 Norderstedt, Germany Phone: +49 (40) 50096 176	N80	2500KW	1. Wind Turbine Spec & Work Scope of Mai-Liao project 2. Price, delivery date, & Terms conditions 3. Manufacturing situation 4. ICP intention 5. Future Cooperation in Taiwan market
2006/8/15 (Tuesday)	Repower	Hamburg, Germany 德國 漢堡	Mrs Franca Frommer Teamassistentin Unternehmensentwicklung REpower Systems AG Alsterkrugchaussee 378	MM82	2000KW	1. Wind Turbine Spec & Work Scope of Mai-Liao project 2. Price, delivery date, & Terms conditions 3. Manufacturing situation 4. ICP intention 5. Future Cooperation in Taiwan market
2006/8/17 (Thursday)	Fuhrlander	Frankfort, Germany 德國 法蘭克福	Dr. Jan Ross / Carina Demuth Projektmanagement / Sales Fuhrländer Aktiengesellschaft Auf der Höhe 4 56477 Waigandshain Tel.: 02664 / 99 66-0 Fax: 02664 / 99 66-33	FL2500-80	2500KW	1. Wind Turbine Spec & Work Scope of Mai-Liao project 2. Price, delivery date, & Terms conditions 3. Manufacturing situation 4. ICP intention 5. Future Cooperation in Taiwan market
2006/8/21 (Monday)	Vestas	Billund, Denmark 丹麥 比爾朋	Mr. Jeff Cheong Head of Sales Vestas Australian Wind Technology Pty Ltd Ph: +61 3 8698 7345	V80-2.0	2000KW	1. Wind Turbine Spec & Work Scope of Mai-Liao project 2. Price, delivery date, & Terms conditions 3. Manufacturing situation 4. OEM Opportunity 5. Future Cooperation in Taiwan market Note: 1. Vestas is the largest company in wind turbine manufacturing.
2006/8/23 (Wednesday)	Gamesa	Madrid, Spain 西班牙 馬德里	Mr. Pedro E. Artigao Gamesa Eolica Asia-Pacific Business Director Torre Picasso, 9th Floor	G80-2000	2000KW	1. Price, delivery date, & Terms conditions 2. Manufacturing situation 3. OEM Opportunity 4. Future Cooperation in Taiwan market Note: 1. To Verify manufacturing capacity. 2. Current production status.

小組提報摘要：

此次訪歐，小組均向各風機廠家要求

- 風機規範及必須符合 IEC Class Ia/b
- 時程(2007 年 7 月底前)
- ICP(五項選二項)
- 最高 22% Down payment(原則上廠商可接受)
- 試車成功後，兩年保固需求(原則上廠商可接受)
- 每天 4 萬歐元的延遲罰款(廠商認為罰則偏高，很難接受)

肆、本文

肆(一) 與 Nordex 會議：

一、 小組成員自我介紹，並以簡報檔提報漢翔公司能量及簡介，同時介紹台灣在風力發電目前興建計畫及未來之規劃建置能量等。

二、 說明參察案的風機規格、時程及 ICP 要求

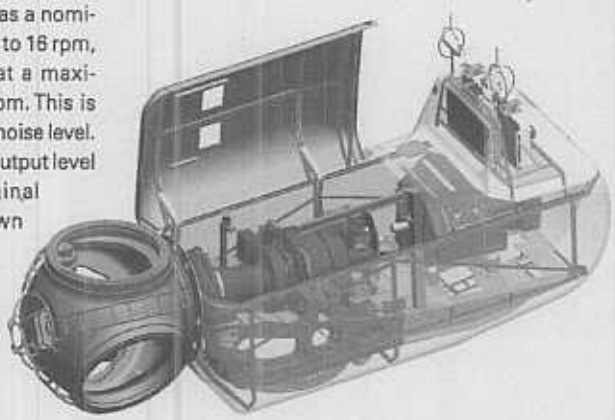
三、 Nordex 公司及實績簡介：

2006	Installation of Germany's 1st offshore turbine a N90/2500
2005	**Launch N90/2500 kW**
2003	Installation of the 2,000 Nordex turbine / 1. Offshore turbine installed
2001	Commencement of industrial rotor blade production
2002	IPO
2000	Transfer of wind power activities to the new Nordex AG
	Completion of the world's first series 2.5 megawatt wind turbine
1999	Installation of the 1,000th Nordex turbine
1995	**Construction of the world's first series megawatt wind turbine**
1992	Establishment of production operations in Germany
1987	**Production of the world's largest series wind turbine (250 kW)**
1985	operation of Nordex in Denmark

四、 Nodex 建議機型 N90。

TECHNICAL SPECIFICATIONS.

The higher speed at which the HS version of the N90/2500 rotates at wind speeds of between 8 and 13 m/s means that it produces a higher energy yield than the LS version. A further major difference between the HS and LS versions, apart from suitability for different locations (strong wind/light wind), is the noise level. While the HS has a nominal speed of up to 16 rpm, the LS is run at a maximum of 14.9 rpm. This is reflected in the noise level. The reference output level at 95 % nominal output is shown below:



N90/2500 LS				N90/2500 HS
reduced-noise operation at 95 % red. nominal output			at 95 % red. nominal output	at 95 % red. nominal output
101,5 dB(A)	102,5 dB(A)	103,5 dB(A)*	104,5 dB(A)	106 dB(A)
1.600 kW	2.000 kW	ca. 2.200 kW	2.500 kW	2.500 kW

*calculated

五、 與 Nordex 討論結果

- Nordex 對本案準備最積極充分
- Nordex 同意協助塔架在國內製造及認證
- 控制介面 SCADA 待雙方工程人員進一步協商
- 如果簽約，Nordex 同意自費提供常駐技師一名協助本案
- Nordex 同意以 N60/S70/N77 機型配合國內 ICP 要求
- Nordex 願意給本公司在台唯一代理權，共同開發台灣風電市場

六、詳細會議記錄如後。

NORDEX ENERGY

Minutes of Meeting

Subject: AIDC- Nordex Cooperation Discussion for Taiwan market

Date:	**14.08.2006**	
Location:	**Bornbarch 7, Conference Room, Germany**	
Participants:	Name	Company/Function
	Judith Y.N Chang	AIDC, Legal Specialist
	Gary Lo	AIDC, Director Material Department
	Long-Shin (Stanford) Lee	AIDC, Power Energy Business Director
	Y. T. Huang	Ministry of Economic Affairs, Director
	Robin Lo	AIDC, Senior Manager Power and Energy Business Department
	Tony Adam	Nordex – Expert Markets
	Karsten Brüggemann	Nordex - Sales Manager

Reported by:	K. Brüggemann	Phone. -176	Fax: -491
Reporting Date:	14.08.06		
Distribution:	Nordex Internal		

Item	Description	Action No.
1	**Meeting Purpose** AIDC was awarded the procurement for wind turbine generators from Taiwan Power Company for the Yulin Mai-Liao Wind Farm Project and visited Nordex to evaluate the purchase of 15 turbines and potential long-term business cooperation.	
2	**AIDC Introduction** AIDC was presented by Dr. Lee. They have just completed one project with 6 x 2.0 MW turbines. Now they are procuring the above mentioned Wind Farm Project and regard this project as an entry into a potential long-term cooperation with a selected turbine manufacturer.	
3	**Nordex Introduction** Nordex was presented by K. Brüggemann with special emphasis on the Asian market and the recommended products. For the Taiwanese market the N60 or N90 2500 HS was proposed. AIDC raised the issue whether the N80 would also be suitable especially because of its IEC1a certification. From side of Nordex it was clarified that IEC1b is in terms of the survival wind speed exactly the same. The difference is only on turbulence. Nordex will prepare a statement on this issue for AIDC to forward to TPC.	1

Item	Description	Action No.
3	**Discussion on Mai-Liao** Time schedule, price and warranties are the major decision factors for AIDC. Contract award to turbine supplier is scheduled for September 2006. Commissioning must be completed by April 2008. Delivery should be as early as possible. Requested was Q4/2007. Wind Data was handed over to Nordex. Nordex will prepare a site evaluation on this basis. The following split of scope was agreed: Nacelle, hub and rotor blades FOB Hamburg port, Rostock/ CIF Taichung port, tower specifications/ drawings and QA inspection from Nordex. Tower (optionally by Nordex), foundation templates and bolts, electrical work and civil work by AIDC. SCADA supply to be discussed by both parties. Erection supervision, commissioning and 500h maintenance will be quoted on daily rates. The O&M setup was agreed as follows: Service and maintenance will be performed by AIDC. Nordex will provide a permanent local supervisor and will replace defective components during the warranty period. Labour cost will not be charged during this period between AIDC and Nordex. Commercial: Down payment is max. 22%. Other payments on milestones to be agreed. Warranty should be 2 years after commissioning. Delay LD were requested to be 1.5 Mio. NTD/ day. Nordex has handed over the standard Supply and Installation Agreement. A revised quotation will be forwarded by Nordex.	2 3
4	**ICP** 2 out of 5 of the following components need to be considered to be sourced locally: 1. rotor blades 2. generator 3. control 4. gearbox 5. main shaft It is not necessary that these components are used for the Mai-Liao project. N60 or S70/77 is also possible. Other criteria is provided on a separate sheet. AIDC will provide German partner of Formosa HI.	4
5	**Distributor Agreement** A draft distributor agreement was handed over to AIDC for further discussions. The exclusivity is limited to TPC and government owned or invested projects.	5

Meeting End

Action Item List

Action No.	Description	Who	When
1	Statement on IEC 1a/ 1b to forward to AIDC	Karsten Brüggemann	22.08.2006
2	Site Evaluation for Mai Liao	Karsten Brüggemann	22.09.2006
3	Revised Quotation	Karsten Brüggemann	22.08.2006
4	German partner of Formosa HI	Stanford	22.08.2006
5	Draft Distributor Agreement	Karsten	22.08.2006

Nordex Energy GmbH

14.08.2006 Karsten Brüggemann

AIDC

Stanford Lee

肆(二) 與 Repower 會議：

一、 Repower 簡介

1991 – 1998 Foundation of the predecessor firms

2000 Takeover of the HSW-location Husum

2000 Foundation of the REpower Systems AG

2001 Successful IPO

2002 MD-technology Bestseller in Germany

2002 First turbine in France installed

2003 10 % market-share in Germany

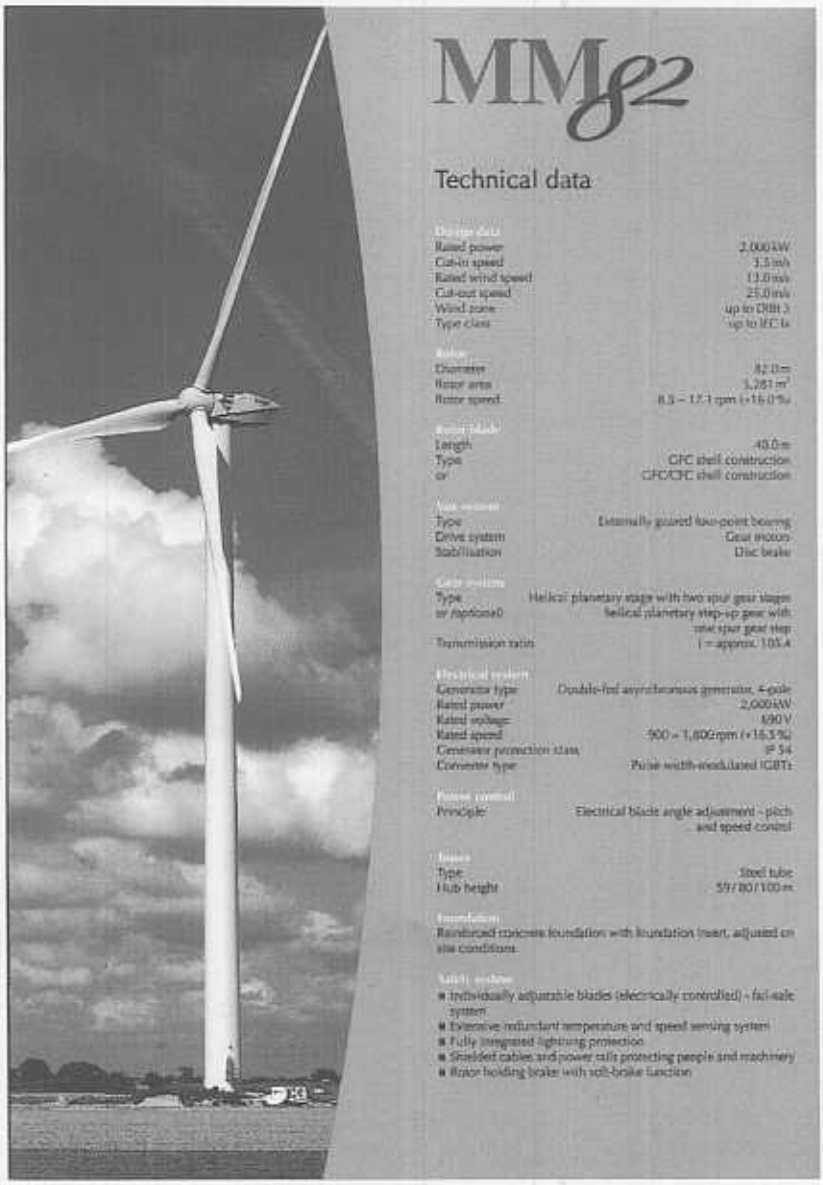
2003 First installations In Japan

2004 REpower overtakes GE in Germany

2004 First projects in P and I, partner in China

2005 First Projects in UK and AUS, Partner in PAREVA becomes shareholder

二、 Repower 建議機型



三、 會議摘要

・Repower 含塔架初步報價 xxx 萬歐元

・Repower 同意協助塔架在國內製造及認證，每具可減 xx 萬歐元，

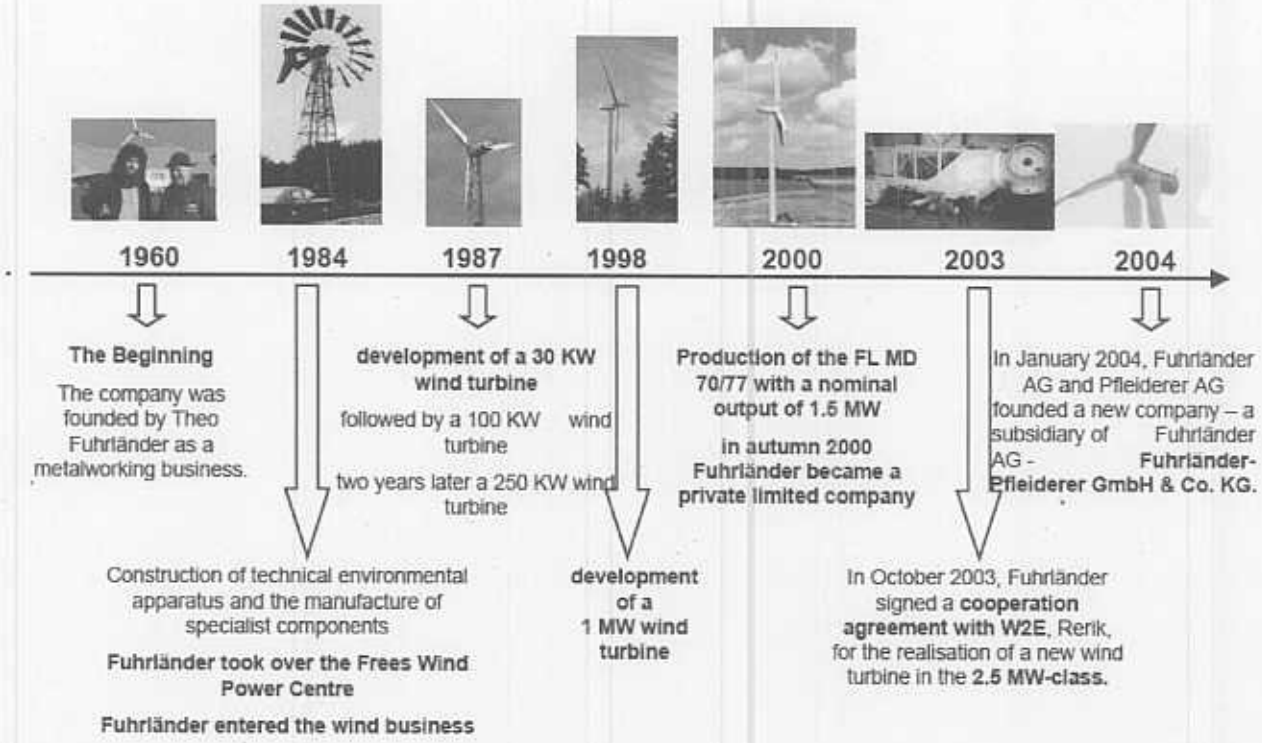
・2007 年交期必須視 60Hz 的齒輪箱供應商產能是否來得及配合

・Repower 進入新市場必須經董事會同意，於 8/22 日召開內部董事會後，告知我方因 60Hz 的唯一齒輪箱供應商(winergy)2007 年產能均已銷售給美國簽約專案，因此確定無法滿足本公司參寮案交期上的需要，但 Repower 董事會對與本公司合作開發台灣市場仍有高度興趣。

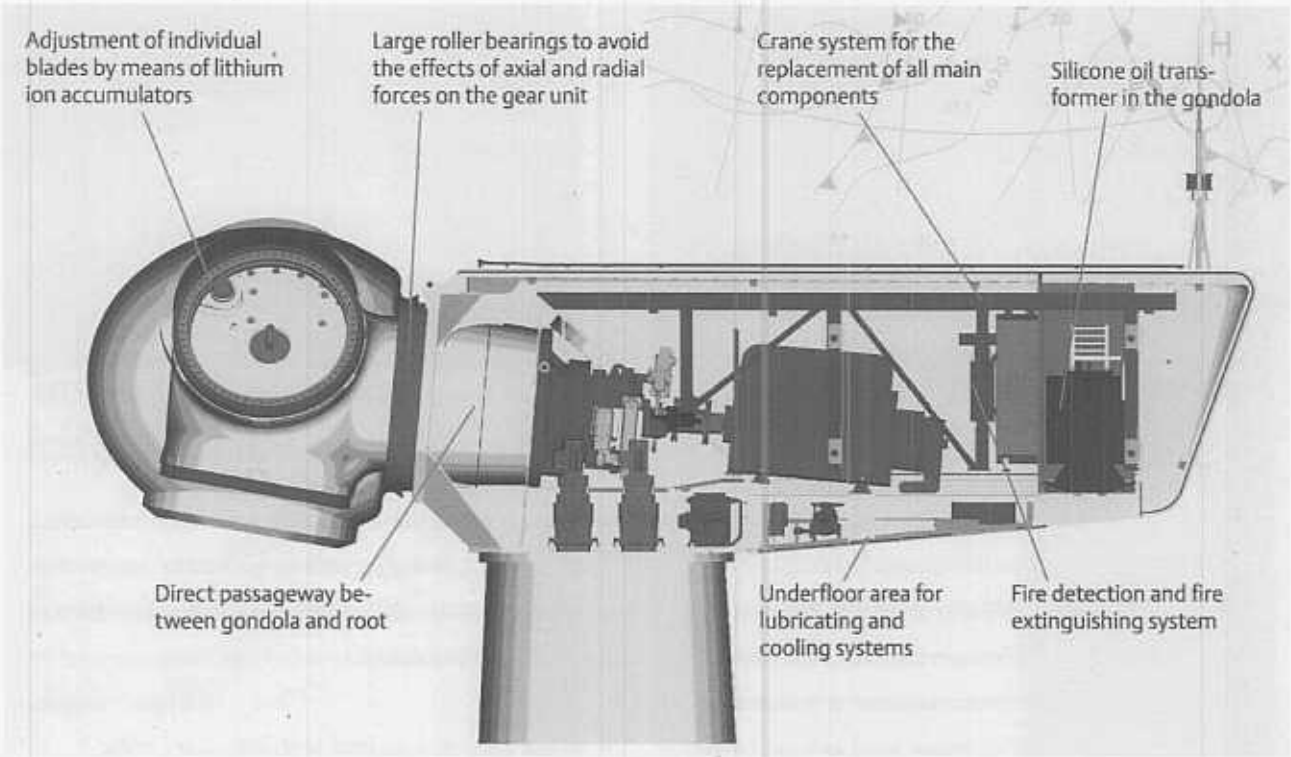
・Repower 已正式函告不報價。

肆(三)與 Fuhrlander 會議：

一、 Fuhrlander 簡介



二、 Fuhrlander 建議之機型 FL2500



三、會議摘要

・對台灣風電市場有高度之興趣
・對 ICP、技術轉移態度開放且積極
・F 公司與 W2E 合作所開發的 FL2500 風機，採用許多操作上所得到實務經驗的新設計，尤其是移除轉子與齒輪箱之間的傳動長軸，讓轉子直接與齒輪箱連接，再以軸承支撐中間之結構，此舉可以大幅減重、降低震動及運轉應力，提高齒輪箱之壽命。
・小組亦告知 F 公司一個參考價格，希望 F 公司能慎重考慮
・F 公司同意重新考慮報價。

、詳細會議記錄如後

Meeting Minutes 16:45 on August 17 2006

AIDC has clearly expressed the Mai-Liao project scope of work, ICP and other requirements. AIDC also addresses the willingness to cooperate with Fuhrlaender.

Fuhrlaender has also expressed the interest of this project. Fuhrlaender is also willing to offer the possibility of out sourcing and purchasing parts from Taiwan.

A presentation from W2E regarding the 2500 KW machine which Fuhrlaender recommended is done by W2E CEO Christoph Klewitz.

Fuhrlaender understand that AIDC requires:
1. 22 % advanced payment and the rest of the payment is based on the milestone.
2. Two-year warranty after the commission for wind turbine
3. The liquidated damage for the project is around 40,000 Euro per day

However, Fuhrlaender has to further evaluate the delivery schedule, payment schedule, ICP proposal and other offers to meet AIDC's project requirements. Fuhrlaender will come back with proposal by August 25 2006 to meet AIDC request.

Fuhrlander Sale director

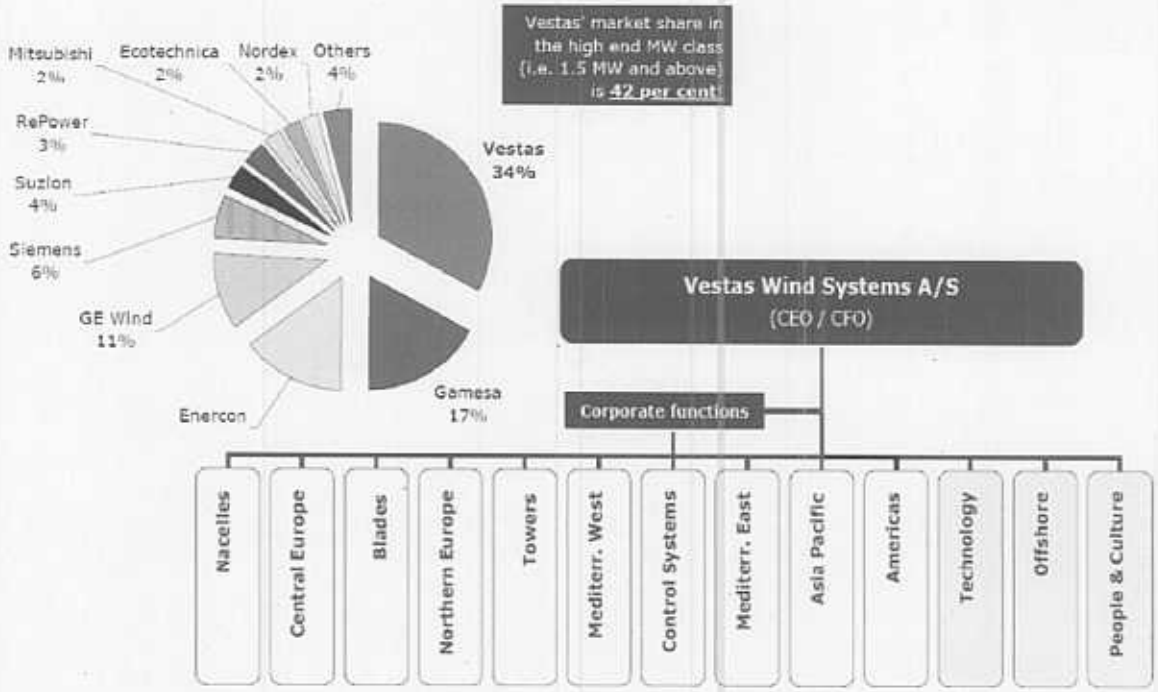
Dr. Jan Ross

AIDC Director

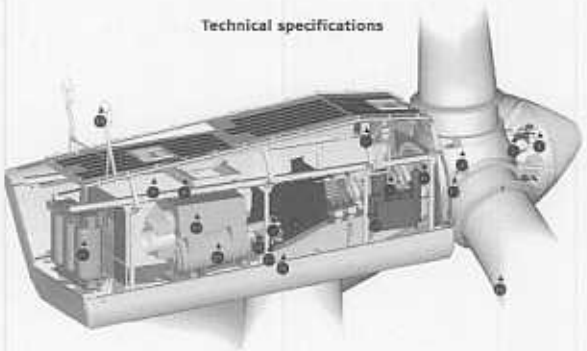
Dr. Stanford Lee

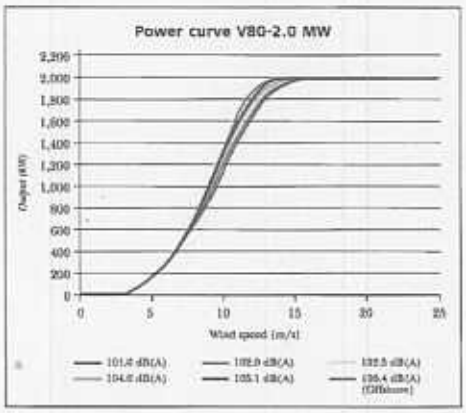
肆(四) 與 Vestas 會議：

一、Vestas 簡介：Vestas 是目前市佔率在高的領導廠商。

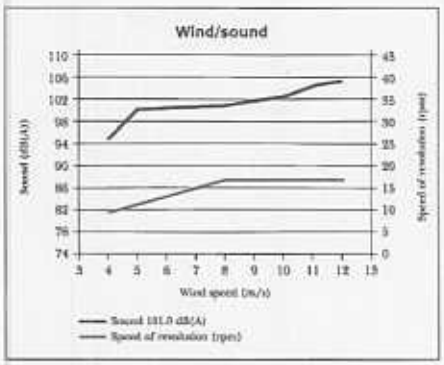


二、Vestas 建議之機型 V80-2.0





The figure above illustrates the relationship between wind and sound levels, and that between wind and speeds of revolution for turbines equipped with OptiSpeed®. It clearly shows the sound level advantages of lower speeds of revolution because the beneficial effect on sound levels of lower speeds of revolution is approximately 7 dB(A) lower at 4 m/s than at 8 m/s. For other sound levels, the benefit can be as much as 10 dB(A). Please note that a decrease of 3 dB(A) is considered to represent a halving of the sound level.



The sound output level can be adjusted by varying the revolution speed of the turbine as illustrated in the figure above. In practice, this means that, for example, the sound level recorded at a distance of 340 m (hub height 78 m) can be reduced from 44.5 to 40.4 dB(A) – i.e. by more than half the recorded level.

三、會議摘要

・對台灣風電市場有興趣(台電彰工案風機組採用 VestasV80-2.0)

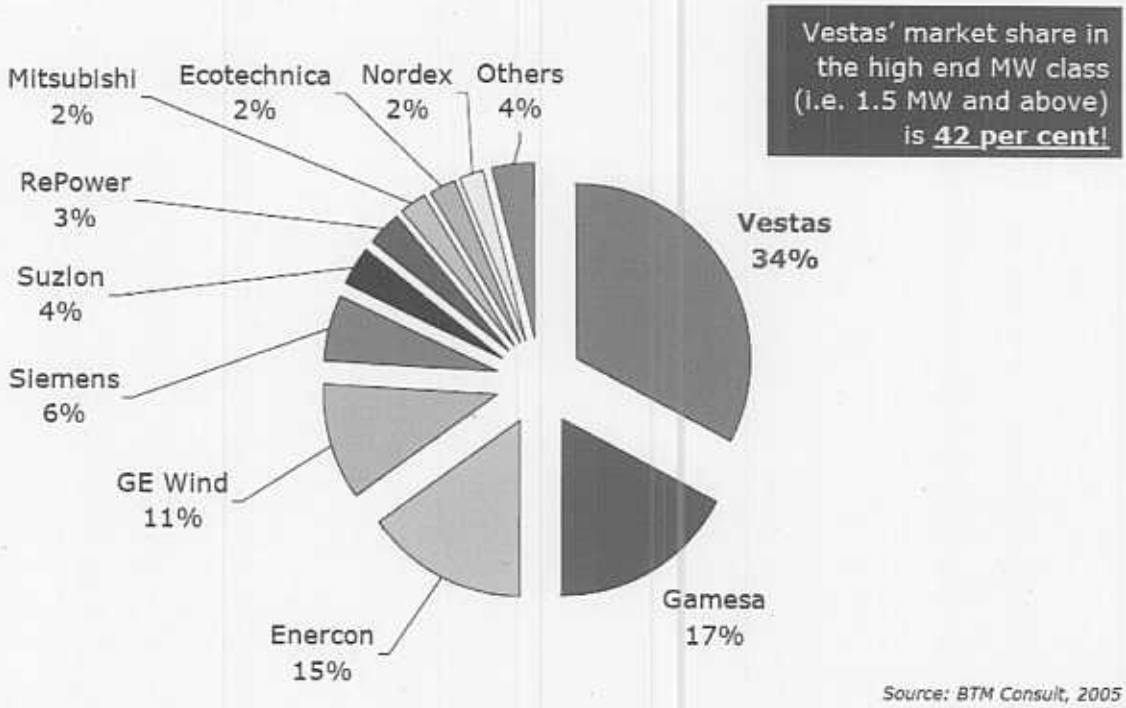
・但全盤不同意台灣對 ICP、技術轉移的做法，也不會配合，且姿態相當高。

・目前含塔架報價每具 20X 萬歐元，且塔架與風機不分開銷售(經協商爭取塔架由國內廠商製造，但仍未獲同意)。2007 年第四季尚有風機餘額，但言明若不加價及趕快簽約，將優先提供給價格較好的日本市場

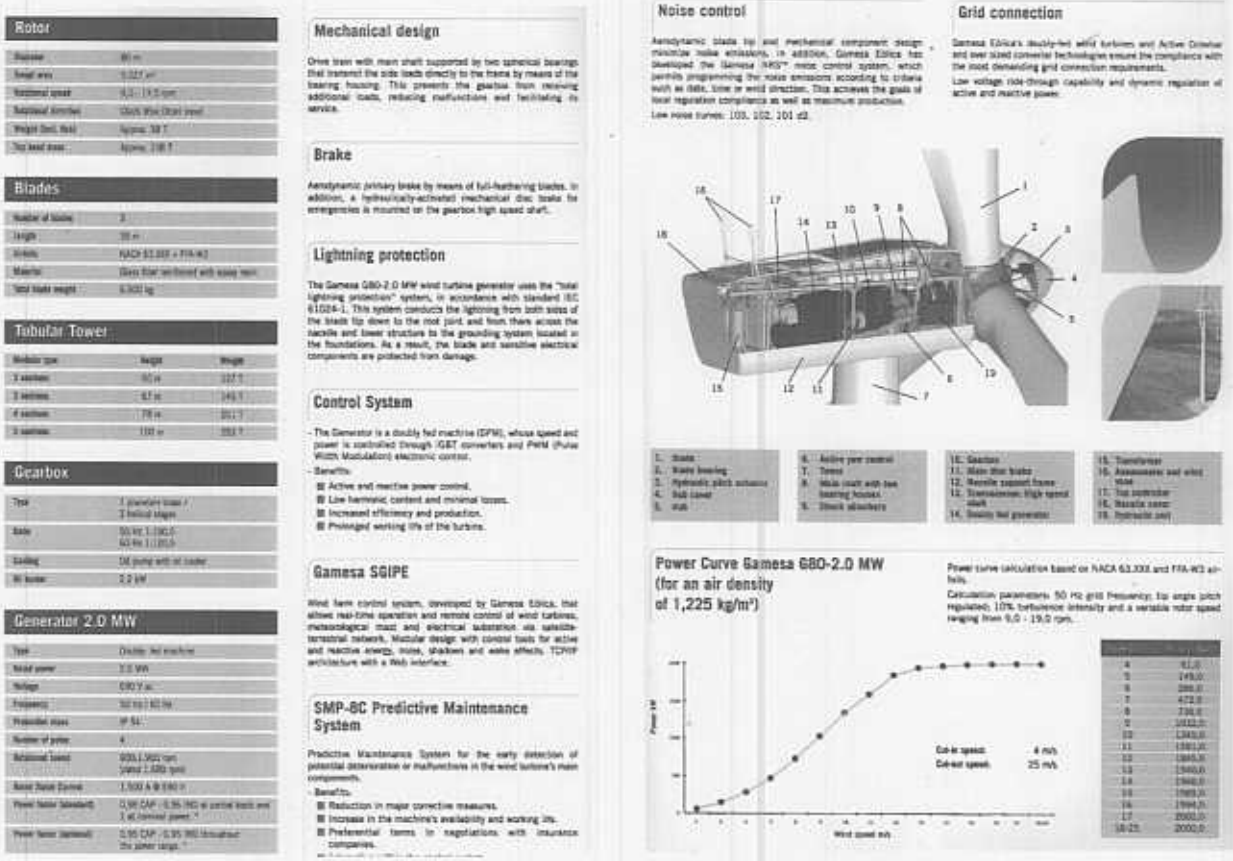
・澳洲電力公司 ROARING Thinking Energy 一次下單就高達四十幾具(ROARING 所訂購之 Vestas 機組，組裝完畢待運之照片見下圖)。為貼近市場，目前 Vestas 已將銷售總部從丹麥移往澳洲，並在澳洲設有葉片製造廠，可見經濟批量在談判上的力量。

肆(五) 與 Gamesa 會議：

一、Gamesa 簡介：Gamesa 是僅次於 Vestas 目前市佔率第二之風機領導廠商。



二、Gamesa 建議之機型 G80-2000



三、會議摘要

・台電香山案已採用 Gamesa G80-2000 風機

・對本公司深具好感，也願意與本公司合作開發台灣風電市場

・同意與本公司及其他台灣之廠商合作共同解決其產能瓶頸問題

・對本公司面臨台電參察案的問題，同意積極解決，但坦承此非目前談判層級人員之權限，因此

・建議公司高層能利用 Gamesa CEO 於 9/13 日前往天津主持風機生產廠開幕機會，商談解決交運地及交期問題，同時建立雙方高層溝通機制，加強未來雙方合作機會。

・經濟部駐西班牙經濟組組長陳銘師組長與 Gamesa 管理階層熟悉，且積極從中協調，助益甚多。

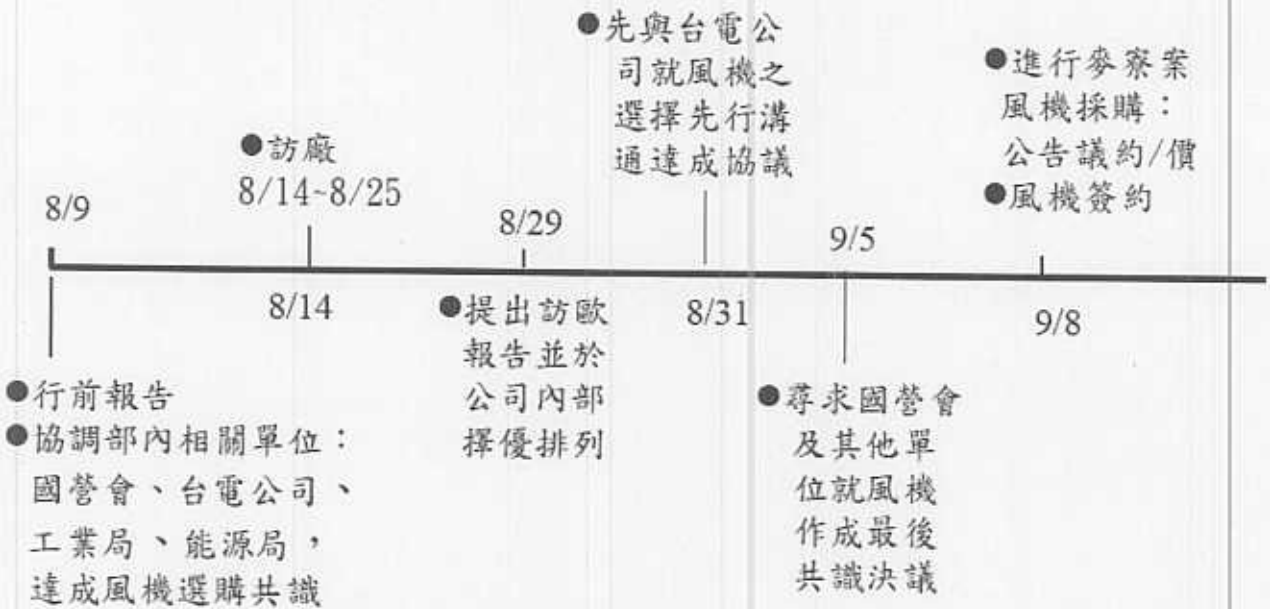
・Gamesa 是本次唯一同意訪歐小組參觀葉片製程的公司

五、結論與心得：

一、歐洲風機廠商拜訪結果綜整表。

漢翔公司歐洲風機廠商拜訪結果綜整表						
編號	廠家（國別）	機型(KW) IEC Class	交期	是否同意國內自製塔架？	是否願意配合工合(ICP)？	其他優惠措施
1	Nordex（德國）	N90（2500KW）IEC Class Ib	2007年第四季	同意	部分同意	願意給本公司在台獨家代理權，與本公司合作開拓台灣市場
2	Fuhrlander（德國）	FL2500（2500KW）IEC Class Ia	分三批交運 第一批:2007年第四季 第二批:2008年 第三批:2008年	同意	願意配合	有意願與本公司合作開拓台灣市場
3	Repower（德國）	MM88（2000KW）IEC Class Ia	不報價			
4	Vestas（丹麥）	V80-2.0（2000KW）IEC Class Ia	2007年第四季	經協商爭取塔架由國內廠商製造，但仍未獲同意	完全不同意	
5	Gamesa（西班牙）	G80（2000KW）	2008年底或2009年初	同意	願意在台灣製造部	有意願與本公司合作開

後續計畫及作為。



三、心得

本次訪歐，發覺德國風機廠商對本公司及台灣風力發電市場相當陌生，但經過小組介紹後，均對公司從航太轉而投入風力產業及市場均持高度肯定、信心及合作意願。德國風機廠商對技術移轉及 ICP 配合度較高，可能是有持續不斷研發創新的關係。德國各風機廠均致力於大型風機的研發如：Nordex 2.5M ，Repower 5M 及 Fuhrlander FL2.5M 機組。Vestas 對技術移轉及 ICP 配合度較低，可能是受 2001 年 Gamesa 技轉之後成為其競爭對手有關，目前 Vestas 主力產品為 2.0 及 3.0M 之機組 。Gamesa 對本公司態度較開放及友善，且熟悉台電需求及履約。但 Gamesa 如堅持從天津出貨，則 Gamesa 風機無法列入考慮。

四、各公司在中國大陸均有合資公司或設廠

Nordex:

西安 N43(JV)

銀川 S70/N77(JV)

保定 N60 Blade

Repower:

2002: REpower licenses the REpower 48/750 to Goldwind 金風 and Zheijiang Windey 浙江 in Hangzhou:

2004: REpower licenses the MD 70/77 to Dongfang 東風蒸汽渦輪 Steam Turbine Works in Deyang，包頭(JV)與 Vestas 為同一家

Fuhrlander:授權大鹿島公司製造 FL1000

Vestas:對大陸市場較保守，但仍在保定設廠，並於波蘭及澳洲設有葉片廠

Gamesa:天津生產 G47/G52/G58 風機

五、建議事項：以目前台電標案之合約價金及限定不得從大陸出口等規定，未來在熱絡的風機市場環境中，要買到歐美地區製造風機之可能性愈來愈低，將延誤推動風力發電期程。台電公司應及早規劃因應。