

DEWI Partnership in Canada

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Canada is with its 9.982.000 km² the second largest country in the world. It has plenty of natural resources for a population density of 3 inhabitants per km². Now that the time for wind energy is coming, DEWI is willing to contribute with its know-how to the development of wind energy in this country. In this article we review briefly two of the market drivers for the development of wind energy: the need for additional electricity generation capacity and the political framework. After considering the volume of projects under development, a way is shown how DEWI will be present in Canada in order to support its clients.

Power Generation

The installed power capacity amounted to 113 GW in 1997, the largest part of it being contributed by hydro-power, followed by thermal and nuclear power generation. Canada's generation level was approximately 551 TWh in 2000 and is expected to increase to 707

	Installed capacity	Production
Total	113 GW	521 TWh
From hydro-power	59 %	67 %
From fossil fuels	29 %	24 %
From nuclear fuel	12 %	15 %

Tab. 1: Electricity production in Canada, statistics of 1997.

TWh by 2020 to meet national demand as well as to increase exports. Although the production capacity of Canada increased at the average annual rate of 4% during the period 1973-1997, the development of new capacities in large hydro or nuclear power plants is becoming increasingly difficult because of the environmental controversies associated with these sources of electricity. The production of electricity could only be increased during the last years through a larger contribution from fossil fuels and increased importations from the USA.

The balance of production and demand is very much dependant on the interconnection between the Canadian provinces as well as between each of these and the neighbour states in the USA. Canada is currently a net exporter of energy, although Alberta, Québec, and Prince Edward Island (PEI) are net importers. Seventeen major utilities and about 60 industrial establishments, generate electricity for their own use (pulp and paper, mining, and aluminium melting). In addition there are about 350 smaller utilities across Canada, 85% of them are located in Ontario. Ontario Power Generation Inc., Hydro-Québec and B.C. Hydro are the three most prominent utilities in Canada. Many of these establishments intend to play a role in the field of wind energy. The electric power industry has had a significant presence within the Canadian economy for more than a century. In 1997, almost 80.000 people were directly employed by the industry. The population of Canada has developed an awareness for electrical energy issues over the years and this is a basis for the acceptance of the newcomer in the portfolio of power generation technologies. Considering the need for additional power generation, the availability of large spaces, the technical potential of balancing the variations of wind energy production with the largely available hydro-power and last but not least the favourable wind conditions in large areas, the country calls for a development of wind power throughout Canada.

Political Framework

The Canadian Wind Energy Association (CanWEA) urged in 2001 the governments to embrace wind technology and set the goal of 10.000 MW by 2010. The Wind Power Production Incentive-Program (WPPI) has been set up by the federal government to foster the development of wind power. The pace of development of the wind energy business in each of the 10 provinces is also very much dependant on local conditions such as the objectives of the provincial government and the associated incentive programme. Whereas some provinces, such as Québec, set up a framework for the structured development of large projects with expected collateral benefits for the local industry and employment, other provinces leave more freedom to the market as to the project size, the time schedule and the involvement of the local industry. The cumulated objective in the range of 10.000 MW by 2014 triggers a buoyant activity in the field of project development. This is not expected to be a flash-in-the-pan because the variety of incen-

tive schemes and time frameworks set up by the different provinces will contribute to a sustained activity over many years.

Year	1999	2000	2001	2002	2003	2004	2005
Installed Capacity [MW]	100	11	83	14	86	123	238
Cumulative capacity [MW]	127	138	220	235	321	444	682

Tab. 2: Installed and cumulative capacity in Canada.

Current and Future Development

Considering the growth of the installed capacity at an average rate of more than 30%/year over the past 6 years from 126 MW in 1999 to 682 MW at the beginning of 2006, as well as the 2.860 MW of projects that are either under construction or that have signed a PPA, the trend is set to reach a significant part of the goal defined by CanWEA for 2010.

Among the many initiatives, the attention of the wind energy community is especially attracted by the larger Requests for Proposals (RFP). On February 25, 2005, Hydro-Québec Distribution signed 8 contracts for the purchase of wind-generated electricity that have a term of 20 years and total 990 MW. The commissioning of the wind farms is gradually scheduled for 2006 to 2012. On November 21, 2005, the Ontario Government has selected 955 MW in 8 projects. A new RFP from Hydro-Québec Distribution has been published on October 31, 2005 the goal of which is to provide 2.000 MW additional wind power capacity with commissioning gradually scheduled from 2009 to 2013. The submissions are expected until April 04, 2007.

DEWI and Canada

In March 2005 a delegation from Prince Edward Island visited DEWI and its test site in Wilhelmshaven with the purpose of obtaining concrete and relevant information for the establishment of the future Wind Energy Institute of Canada (WEICan) as well as to identify the opportunities for cooperation, joint ventures, exchanges and shared programmes. Mr. Jens Peter Molly expressed the interest of DEWI to actively support the creation and the development of such an institution. In the meantime, considering the ambitious goals of the various provinces, the readiness of the Canadian people to embark in large wind farm projects although the currently installed capacity is still modest, DEWI considered that it could offer its services to the Canadian wind community. DEWI contributed to the 2005 CanWEA Conference in Toronto with presentations on Wind-Farm Power Performance Verification as well as on Financial-Risk Management in Wind Energy Projects. Two seminars (Wind Turbine Techniques and Wind Farm Projects) were organised within short notice in Montreal on November 23-24, 2005 with the assistance of the Canadian German Chamber of Industry and Commerce and had indeed a very good participation. Several participants made clear that the presence of DEWI in Canada would be welcome. DEWI offers another two seminars in a near future about Wind Project Financing and Risk Management in Calgary and Toronto (March 24, 2006 and March 27, 2006 respectively). Dr. Klug will also talk about "Wind-Farm Performance Verification" during the one-day seminar Wind Energy - "Made in Germany" 2nd edition organised in Montreal by the Canadian German Chamber of Industry and Commerce jointly with the Federal Ministry of Economics and Technology and the Federal Energy Agency on March 28, 2006.

Considering the fast pace of wind project development as well as the various schemes under which they are developed in the different provinces, DEWI has been looking for a partner that would bring country-specific know-how as far as business practice, project finance and administrative regulations are concerned. After considering several potential partners, a partnership agreement was signed with ORTECH in Toronto. ORTECH is a wind energy research, advisory and consulting services firm with 35 employees, located near Toronto, Canada. ORTECH, formerly known as Ontario Research Foundation has been in business since 1928 and has been providing applied research, testing services and consulting in atmospheric sciences since the 1950s. Since the year 2000, ORTECH staff has been involved in every aspect of wind power and water power project development in North America. Project involvement includes a completed run-of-river hydro plant, a 67.5 MW wind farm, over 300 MW of projects under construction and over 300 MW under development. ORTECH has in-house



Fig. 1: DEWI seminar in Montreal, 2005.

expertise in resources assessment, project economics and plant operation. ORTECH brings a 75-year track record in consulting and a 5-year track record in wind energy consulting and financial advisory services to the joint venture. Expertise areas include a detailed knowledge of the North American wind energy marketplace, a thorough understanding of the project development process, extensive financial and risk analysis capability, and select wind measurement and resource assessment experience.

Conclusion

In this fast-growing market, driven by increasing needs of electricity and political incentives, the partnership with ORTECH allows DEWI to offer all wind-energy related services in Canada such as all kind of measurements (wind, power curves, power quality, acoustic noise, load measurements, condition monitoring), complete technical due diligence (from energy yield prediction over construction survey to performance monitoring), training courses, applied research and studies. The development of the upcoming WEICan will be followed with great interest and will be supported as far as possible. DEWI is eager to see the first turbines being tested by WEICan.

References

Natural Resources Canada
Canadian Wind Energy Association

DEWI Partnership in Italy

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DEWI ha già insediato uffici in Germania, Francia, Spagna e Brasile. Al fine di cooperare con partner locali DEWI ha inoltre recentemente stipulato accordi di cooperazione con le società FICHTER Italia (sede italiana di FICHTNER) Nel DEWI's ufficio centrale a Wilhelmshaven, Francesco Durante rappresenta attualmente il referente per l'Italia.

I prezzi di cessione dell'energia sono attualmente relativamente vantaggiosi in Italia rendendo così redditizio lo sviluppo di progetti eolici. Si registra di conseguenza una veloce crescita del numero dei progetti eolici stessi.

I progetti eolici italiani sono principalmente concentrati in Italia Meridionale, in Sicilia ed in Sardegna. I siti sono spesso locati in zone montagnose, talvolta in aree con elevate pendenze. Secondo gli standard internazionali queste condizioni portano alla necessità di effettuare numerose misure anemologiche *in situ*. La stima di producibilità energetica richiede inoltre, in molti casi, l'utilizzo di sofisticate tecniche di correlazione dei dati di ventosità e di avanzate simulazioni di fluidodinamica computazionale. DEWI ha svolto in Italia stime di producibilità in 14 progetti per un totale di 500 MW.

La realizzazione di un progetto non coinvolge generalmente solo la stima di producibilità ma richiede anche una completa *due diligence* tecnica propedeu-

DEWI already has offices in Germany, France, Spain and Brazil. In order to cooperate with a local partner on the fast growing market of Italy, DEWI has signed a partnership contract with Fichtner Italia. In DEWI's main office in Wilhelmshaven the Italian micro siting specialist Francesco Durante is the contact person for Italy.

Relatively high feed-in tariffs make many projects in Italy economically viable, which leads to a steep increase in wind farm projects.

The Italian wind farm projects are concentrated in southern Italy on Sicily and on Sardinia. The sites are usually in mountainous terrain, partly with steep slopes. According to international standards and due to the mountainous terrain there are – usually several – wind measurements at the sites, operated by the project developer. Therefore the energy yield assessments for Italy often require the usage of sophisticated wind data correlation methods and often the usage of advanced flow simulation techniques. DEWI has performed energy yield assessments for more than 500 MW in Italy for 14 projects.

Generally, the project and market conditions in Italy require much more than energy yield assessments to realise wind farm projects. Extensive Due Diligence studies analysing the complete projects before start of construction are often necessary. As part of these

tica alla fase di costruzione. Tra gli oggetti di studio di una *due diligence* tecnica citiamo, come esempio, la verifica dell'adeguatezza dei generatori eolici (relativamente alle caratteristiche di turbolenza e di ventosità estrema del sito), la valutazione dell'esperienza operativa con gli aerogeneratori da parte dell'operatore, la revisione degli aspetti tecnici che influenzano le garanzie contrattuali, ecc. Nello svolgere una *due diligence* tecnica DEWI esamina questi e diversi altri punti.

Nel corso della fase di *due diligence* il partner locale FICHTNER Italia si fa invece carico della revisione dei permessi e delle condizioni di pianificazione. La consulenza tecnica non termina peraltro con l'approvazione ed il finanziamento del progetto: FICHTNER Italia supervisiona le fasi di costruzione al fine di assicurare la correttezza dello stato di avanzamento dei lavori. FICHTNER Italia rappresenta, pertanto un importante presenza locale che assicura un appropriato svolgimento dei lavori di realizzazione.

FICHTNER è attiva sul mercato italiano da molti anni. La sede italiana (FICHTNER Italia) fu fondata nel 2003. Da allora, FICHTNER Italia ha stabilito una solida posizione nel mercato italiano fornendo consulenza per la realizzazione di numerosi impianti, principalmente legati a fonti energetiche convenzionali.

Alla realizzazione del campo eolico deve seguire, in una corretta procedura di sviluppo del progetto, la verifica delle *performance* di produzione del campo eolico stesso. Attualmente DEWI svolge in Italia verifiche di *performance* di produzione per sette parchi eolici. Le misure necessarie sono già state completate per cinque dei sette siti sotto esame.

FICHTNER Italia e DEWI hanno già lavorato insieme nel 2004 per la realizzazione di un progetto eolico. L'accordo di cooperazione vero e proprio fu firmato alla fine del 2005. Sebbene stabilita di recente, la cooperazione si è già rivelata efficace. Come primo progetto di cooperazione, DEWI, DEWI OCC e FICHTNER Italia, hanno intrapreso nel gennaio 2005 una *due diligence* tecnica per incarico della Banca UniCredit Infrastrutture S.p.A. relativamente ad un progetto sviluppato da Fri-El in Sardegna. La *due diligence* comprende la ri-analisi della stima di producibilità energetica, la verifica dell'adeguatezza della tipologia di turbine relativamente alle caratteristiche del sito, la revisione dei contratti, la revisione finanziaria, la supervisione dei lavori, la negoziazione contrattuale, l'analisi delle condizioni di fornitura e la verifica della producibilità per i primi cinque anni di operatività.

studies the suitability of the wind turbines for the sites (including extreme wind speeds and turbulence) and the operational experience with the equipment needs to be assessed. Another important issue is the review of the contract and guarantee conditions from a technical viewpoint. With its long experience DEWI is responsible for the wind-related tasks in these studies, among other things.

During the Due Diligence phase DEWI's local partner Fichtner Italia then reviews especially the planning and permission issues. The technical advisory services for the wind farms do not end with the financing of the project. Therefore Fichtner Italia accompanies the construction supervision in order to monitor the proper realisation of the projects. Furthermore Fichtner Italia serves as DEWI's local representative for Italy, thus ensuring a smooth execution of the work.

Fichtner has been operating on the Italian market for many years, and a subsidiary named Fichtner Italia was established in 2003. Fichtner Italia has established a solid position on the Italian market supplying consulting services to various customers in the field of power generation, mostly from conventional energy sources.

After the realisation of the wind farm projects the performance of the wind farms needs to be verified. DEWI is currently performing seven power performance verification measurements in Italy. Five power performance measurements in Italy are already finished.

Fichtner Italia and DEWI have already cooperated in 2004 in a wind power project. The partnership DEWI-Fichtner Italia was established at the end of 2005. Although just established, the cooperation is already successful. In January 2006, as a first cooperation project, DEWI, DEWI OCC and FICHTNER Italy started a complete technical Due Diligence on behalf of the bank Unicredit (Unicredit Infrastrutture SpA) for a wind farm project developed by FRI-EL Green Power S.p.A. on Sardinia including among others energy yield assessment, assessment of the suitability of the wind turbines for the site, contract review, cost studies, supervision of construction and, commissioning as well as performance assessment for the first five years of operation.

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