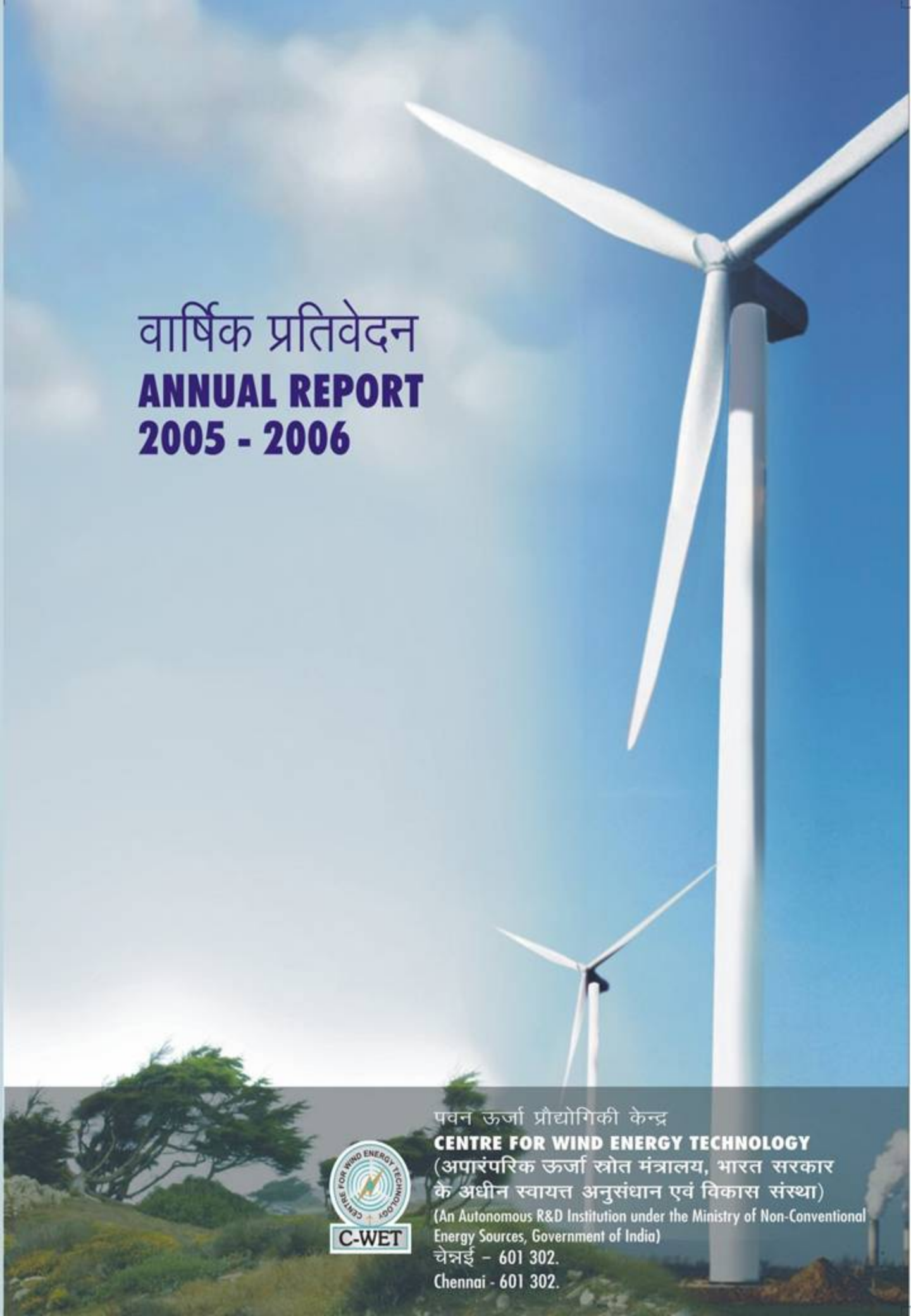




वार्षिक प्रतिवेदन **ANNUAL REPORT** **2005 - 2006**



पवन ऊर्जा प्रौद्योगिकी केन्द्र

CENTRE FOR WIND ENERGY TECHNOLOGY

(अपारंपरिक ऊर्जा स्रोत मंत्रालय, भारत सरकार
के अधीन स्वायत्त अनुसंधान एवं विकास संस्था)

(An Autonomous R&D Institution under the Ministry of Non-Conventional
Energy Sources, Government of India)

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Chennai - 601 302.



Centre for Wind Energy Technology, Chennai

ANNUAL REPORT

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Annual Report 2005–2006





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Centre for Wind Energy Technology, Chennai

QUALITY POLICY

C-WET is committed to achieve customer satisfaction, loyalty and confidence by providing credible, prompt and complete solutions of international quality to all the stakeholders in the wind energy sector.

C-WET, strives to be technical focal point of excellence for the present and future. C-WET shall stay at the forefront of Wind Turbine Technology application by continuously improving its expertise.

CENTRE FOR WIND ENERGY TECHNOLOGY

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EXECUTIVE DIRECTOR'S REPORT

The year 2005-06 is significant because there was no further hand-holding by DANIDA appointed consultants. On a parallel the demand for these services grew manifold. C-WET has stepped up it's R&D programs to address immediate and futuristic needs of the field. Wind resource estimation related activities have been progressing satisfactorily with the seventh volume of the 'wind resource data for India' published during the year. Type testing activities have been continuing both at Wind Turbine test station and in customer's site. The process of preparation of wind turbine certification standards has been initiated. A number of national and international training programs have been organized. Keeping in view the need for dissemination of information on a wider scale, the web site has been redesigned and is presently bi-lingual.



*Hon'ble MOS (I/C) Shri. Vilas Muttemwar
conferring 'Centre of Excellence Award'
instituted by SESI on C-WET.*

Recognizing the quality work done by the centre, SESI presented C-WET a citation and "centre of excellence" award at ICORE 2006 held in Hyderabad.

Research & Development

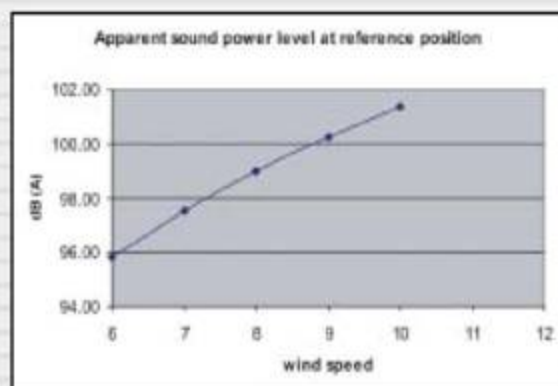
A number of initiatives have been taken under research and development. The focus has been on addressing issues with respect to wind resource, design and development of advanced concepts for wind turbine design and grid management issues.

In order to get a better understanding of the wind flow patterns in some special areas such as Palghat gap and similar situations, Sound Detection And Ranging (SODAR) equipment has been recently procured and is undergoing field trials and calibration at C-WET campus. Comparative studies have yielded useful results. It is proposed to deploy the instrument in Palghat gap in near future to obtain a snap shot picture of wind profiles at heights in the range of 500 to 1000 magl. Such a study would help in getting a means of validating normally used tools for extrapolation of wind environment based on local measurements.

Wind turbine blade design is perhaps the most important element which has not been attempted in the country. There is sufficient indigenous domain knowledge available in other areas such as structures, machinery components and grid interconnection. Keeping this in view a project has been sponsored to the National Aerospace Laboratories to establish design methodologies for wind turbines. Necessary tools to carry out and validate the blade design have been made available to NAL. Grid interconnection and effect of wind turbines on grid and vice versa is a source of continuous debate. In order to help

assessing these aspects simulation models have been set up and were validated by field measurements.

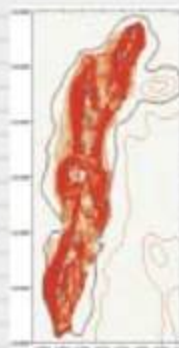
Noise from wind turbines has not yet assumed due importance in India. In order to be ready when it happens, measurements have been carried out to get hands on experience. This will also help in setting up detailed procedures for such measurements as per IEC standards.



Apparent sound power level at reference position as per IEC recommendations

Wind Resource Assessment

Wind resource assessment has been continued in uncovered areas and 59 stations are in operation. All the new stations use 50 m tall masts with anemometers at three levels. The seventh volume of 'Wind Energy Resource in India' was released during the year. Keeping in line with modern requirements turbulence intensity plots are included in the publication. A number of state government and private sector sponsored projects for wind measurements have also been undertaken. The programs in the North Eastern states have been making good progress in terms of installations and data collection.



Micrositing plan for a hill in Karnataka where a 15 MW wind farm was proposed

A number of micro-siting assignments and due diligence studies were carried out for a number of wind farm developers. Present knowledge of off-shore wind potential is not very encouraging. Therefore no major initiatives have been formulated. Winds measured on wave breakers projecting into Arabian seas along the west coast also have demonstrated that the coastal winds are very modest.

Wind Turbine Testing

Provisional type testing on Pavan Shakti 600 kW was completed during the year and reports were routed to certification unit through the manufacturer. At the request of NEG Micon, power performance testing of their 950 kW model was undertaken at Chitradurga.



Performance Measurement in progress



The measurements on wind turbines were brought up to the standards specified by ISO/IEC 17025. A pre-assessment by NABL auditors brought out a few issues that required attention and have been attended to since then. The auditors are required to witness the tests being conducted. The accreditation audit is scheduled for the ensuing windy season.

Standards & Certification

During the year 2005-06 two category I certifications were completed. There are eight certification assignments in various stages of completion.



Type Certificate issued to CWEL

Work on preparation of Indian standards for wind turbine testing and certification has been initiated. C-WET has been nominated as the convener of the working group on standards preparation by BIS.

Based on a direction from the ministry, C-WET co-ordinated a software tool development with NIC for keeping track of CCDCs issued by MNES. The software compares the master bill of materials with the applications and gives indications about the

correctness of the specifications of equipment/material being imported.

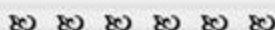
Information, Training, & Commercial Services

A residential training program was organized for participants from China, Myanmar, Sri Lanka, Iran and other countries. The program included subject specific lectures, tutorials, field and factory visits. A similar National training program was organized on the wind farm development related aspects.



Trainees during a field visit to WTTS & wind farming areas

Keeping in view the difficulties faced in data collection from the north eastern states a special training program was organized. In order to give the participants an exposure on the possibilities with wind, a field visit to WTTS and wind farming areas was also organized. Library has been expanded and an on-line search system has been established. Web site of C-WET has now become bilingual and is a popular site for information seekers.





THE CHARTER

The Centre for Wind Energy Technology is a technical focal point for wind energy technologies established by the union Ministry of Non-Conventional Energy Sources at Chennai in 1998. A Wind Turbine Test Station has also been established at Kayathar, Tamil Nadu, with technical and financial support from DANIDA, a Government of Denmark agency.

Mission

C-WET, knowledge based institution of high quality and dedication, offers services and seeks to find total solutions for the major stakeholders across the entire spectrum of the wind energy sector. It supports the wind turbine industry in achieving and sustaining quality such that products of the highest quality and reliability are installed. This would help in harnessing maximum energy available in the wind. C-WET will strongly support the wind turbine industry in developing the know-how and know-why and promoting export of products and services.

Objectives

- To serve as the technical focal point for wind power development in India, for promoting and accelerating the pace of utilization of wind energy and support the growing wind power sector in the country.
- To develop and strengthen the facilities and capabilities, evolve strategies, promote, conduct, co-ordinate and support research and development programmes to achieve and maintain reliable and cost effective technology in wind power systems.
- To analyse and assess wind resources based on the data available from various sources and prepare wind energy density maps / wind atlas / reference wind data.
- To prepare and establish standards including guidelines, procedures, protocols for design, testing and certification of wind power systems, sub-systems and components, taking into consideration the Indian conditions and in line with internationally recommended practices and standards and update the same based on the feedback.
- To establish world class facilities, conduct and co-ordinate testing of complete wind power systems, sub-systems and components according to internationally accepted test procedures and criteria, whereby the total performance that includes power performance, power quality, noise level, dynamics, operation and safety systems is tested according to agreed protocols.
- To accord type approval / type certification which verifies conformity with safety related requirements as per standards, guidelines and other rules for design, operation and maintenance, as well as adequate documentation of quality issues such as power performance, noise, life expectancy and reliability.
- To monitor the field performance of wind power systems, sub-systems and components, effectively utilize this feedback for fulfillment of the above objective and issue of certification, establish and update the data bank on a continuous basis and serve as information centre for selective dissemination.
- To undertake human resource development programmes for the personnel working in the wind energy sector.
- To promote commercial exploitation of know-how, know-why results and offer various consultancy services to the customers.
- To promote the development and commercialisation of any other wind energy systems including stand-alone systems.



Centre for Wind Energy Technology, Chennai

FROM THE UNITS



RESEARCH AND DEVELOPMENT

The Unit has been concentrating on in-house research and is co-ordinating R&D programmes with Academic Institutions, Industry, Experts and Consultants working in various disciplines. The focus is on improving performance of components as well as sub-systems of wind turbines. The intention of this focus is to create and nurture application oriented R&D, for the overall benefit of the wind sector and guides the manufacturing industries towards production of cost effective, high quality wind power systems. C-WET provides organizational support to the wind energy sector through it's R&D Unit so as to achieve and maintain world class and leading technology options.

The R&D Unit is carrying out following projects:

Parameterisation of flow distortion around Wind turbine nacelle: This project aims at studying the dynamics of wind flow around the nacelle body and to determine the position of free stream wind near the nacelle body through a wind tunnel experiment. This would provide the basis for positioning the anemometer on the top of the nacelle for site calibration experiments in the future for power performance testing. This will also assist in correcting the measured power curve for site effects with in complex terrains. For this purpose a scaled model of the wind turbine nacelle was placed in SERC's boundary layer wind tunnel (Fig.1) and simultaneous velocity measurements at fifteen planes across the nacelle frame. The planes were arranged with 9 behind the nacelle, 3 along the nacelle and 3 in front of the rotor.

The idea is to determine locations where free stream velocities could be measured. Data obtained is being analysed.



Fig.1: Velocity profile measurements in Wind Tunnel across the wind turbine nacelle at SERC

R&D Wind Farm: R&D unit is presently working to set up two wind turbines of different technologies as a precursor for development of research capabilities. The "Field laboratory" would be equipped with complete measurement systems and diagnostic tools. The wind turbines are expected to serve as work horses for research. It is further intended to be used for training, experiments and exposure to educational and other institutions.

Study of wind flow pattern across Palghat gap using SODAR: Recently, R & D unit of C-WET has procured mini-pulsed Doppler SOund Detection And Ranging (SODAR) instrument. This device measures the three dimensional wind vectors from 30-1000 m. with a height and time resolutions of 10 m. and 1 min., respectively. It is capable of measuring

zonal (East-West), meridional (North-South) and vertical wind velocities in the lower atmosphere are estimated using principles of Doppler shift.

The mini SODAR comprises of an array of transmitters and receivers (Fig.2) and is easy to set up compared to the techniques employed few years back.



Fig.2: SODAR instrument with 64 transducers

Tower based measurements have specific applications in wind energy estimation. Qualitative characterization of wind profile over heights up to several hundred meters would give a better basis for validation of modeling techniques. Presently, it is being operated at C-WET, Chennai to gain hands on experience.

Fig. 3 shows the typical wind speed and direction profiles over heights of 300 m. agl averaged over 10 min. measured at C-WET Campus.

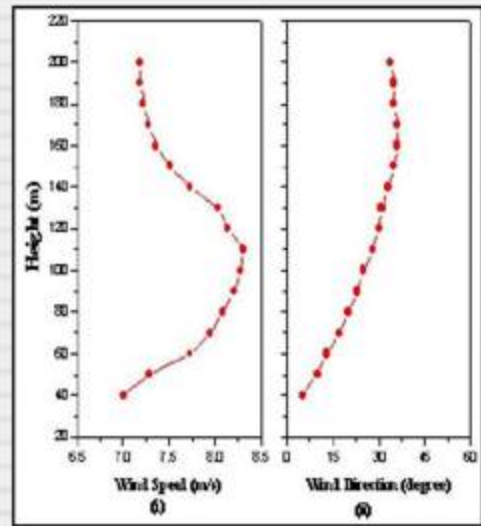


Fig.3: Profile of wind speeds and directions measured at C-WET Campus

Fig.4 shows the vector plots, which indicate the diurnal variability of wind speed and direction with height. The wind speed measured from SODAR was compared with the Kite Anemometer measurements. A comparison between kite anemometer readings and SODAR measurements is shown in Fig.5. There seems to be a reasonably good correlation between the two measurements.

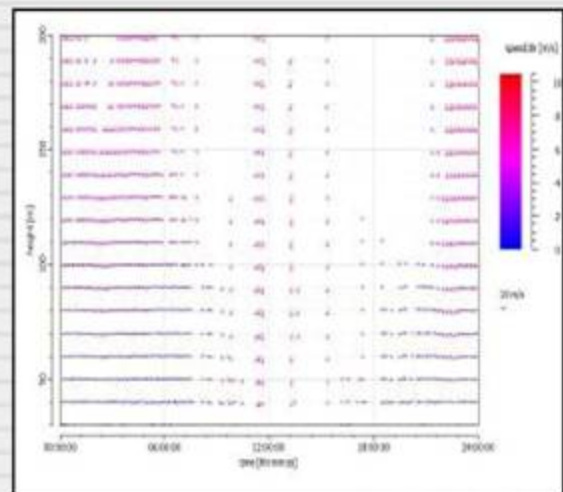


Fig.4: Vector plot of diurnal wind speeds measured by SODAR

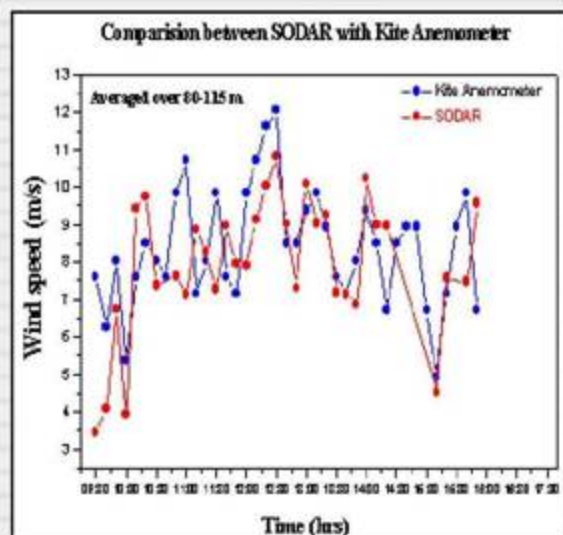


Fig.5: Comparison of wind speeds measured from SODAR & Kite Anemometer

Development and validation of design methodologies and design tools for low and moderate wind regimes:

National Aerospace Laboratories (NAL) has undertaken this project at the request of C-WET with the broad aims of generating an indigenous design data bank for the development of indigenous, low cost, robust, technologically advanced wind turbine blades / rotors optimized for low/ moderate wind regimes prevailing in India. This is keeping in view the significance of the rotor in the wind turbine cost, energy production of the turbine and loads on the machine. The broad outline of this project is to conduct a survey of existing blade profiles and existing modeling strategies for wind turbine aerodynamics, evolving new modeling strategies incorporating in-house computational schemes along with augmentation, carrying out blade / rotor performance studies, wind tunnel and water tunnel studies.

Modeling of Interconnection of the wind turbines with the grid:

In the process of development of a simple tool to study the grid interaction of wind turbines, measurements were undertaken on 110 / 11 kV Keelveeranam Substation to measure the grid parameters (Fig.6) for validating the results of modeling. Parameters were measured at the Group control point, connected to three wind farm feeders and a rural load feeder. Data were recorded for steady state and transient events. Validation and fine-tuning of the model is in progress. Results of the validation are shown in Fig.7.

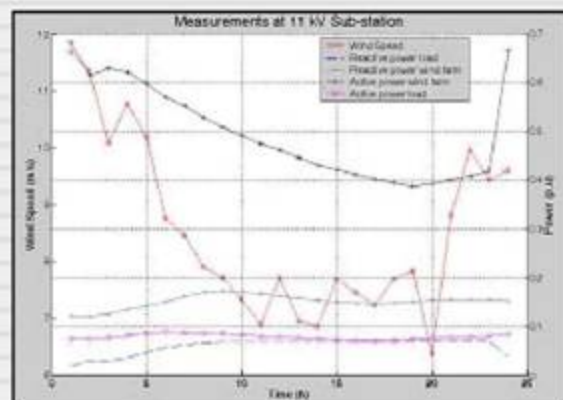


Fig.6: Measurements at 11kV Sub-Station

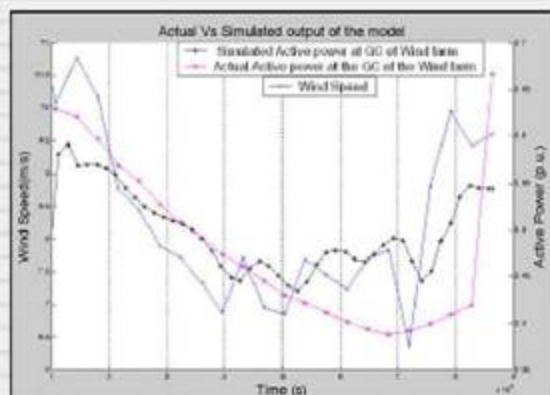


Fig.7: Actual Vs Simulated output of the model

Study of acoustic emissions of wind turbines:

Acoustic emissions of a 225 kW wind turbine were measured as per IEC 61400-11. The aim was to determine apparent sound power level, third-octave band levels and tonality of sound emitted by the wind turbine under measurement for varying wind conditions. Acoustic measurements were carried out with a B&K 2260 Investigator Integrated Sound level meter.

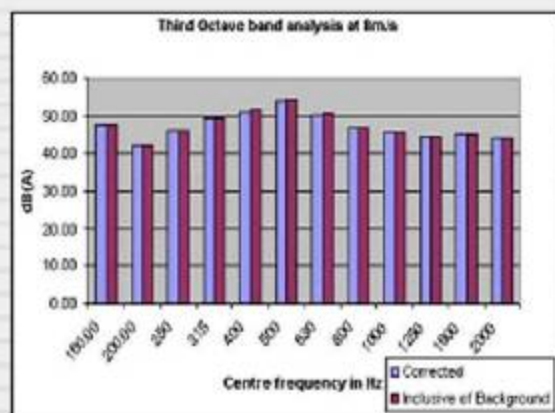


Fig.8: Third Octave band analysis of 8 m/s wind speed

The Equivalent continuous 'A' weighted sound pressure level (L_{Aeq}), third Octave Band levels and narrow band spectra were measured and the results are as shown in figures 8 & 9.

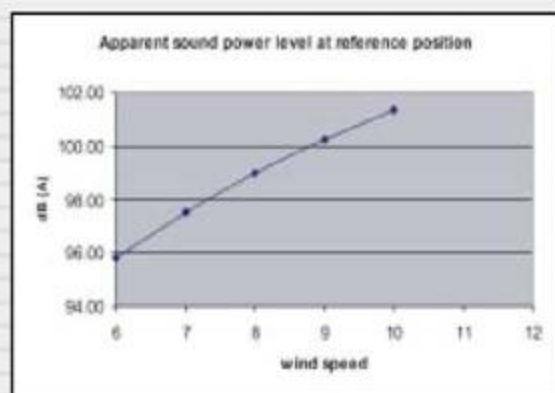


Fig.9: Apparent sound power level at reference position

A Monograph on "Design and Maintenance of Gearboxes – Recommended practices" is now ready for release.

Pungam oil generator in C-WET campus:

A Pungam oil generator has been successfully installed and commissioned at C-WET premises (Fig.10). DG set has been designed to run on Straight Vegetable oil avoiding the need for esterification. The engine starts and stops on diesel to eliminate the starting problems at low temperatures and reduce carbon deposition on fuel injector. The Pungam oil will be automatically heated to 80° C with a heater fitted on the fuel tank to reduce its viscosity and for better fuel efficiency. The generator is rated at 20 kW and has been operated every day serving a load of 10 to 12 kW for 5 to 6 hours in a day. Initial teething problems of control system and filter choking have been resolved to a large extent.



Fig.10: 20 kW Pungam oil generator

WIND RESOURCE ASSESSMENT

The unit is implementing major Wind Resource Assessment programs of Government of India, State Nodal Agencies and other developers. In order to extend support to the industry and developers the unit takes up validation exercises, due diligence studies, micro-siting and evaluation of production estimates in existing wind farm. A beginning has been made in offshore measurements and discussions are on with ONGC to set up offshore measurements in a larger way. The Ministry of Non-Conventional Energy Sources, Government of India have been Sponsoring programmes to measure, analyze and publish wind data in our country for the last two decades. Winds have been measured at five hundred twenty five locations for periods ranging from one to five years since 1986. As on March 31st 2006 fifty-nine stations are in operation in 19 states. During 2005-06 a total number of 14 wind monitoring stations were installed.

The over all status of the wind monitoring stations in the country is given in Table-1. Seventh volume of "Wind Energy Resource in India Vol. VII" containing data from twenty-six stations was released by the Honorable Minister during current financial year.



Fig.11: Hon. Minister, MNES released the "Wind Energy Resource in India Vol. VII"

Table-1: Status of Wind Monitoring Stations (2005-2006)

S. No	State	Number of Stations				
		Established till 31.3.2006	Continued from 2004-05	Closed during 2005-06	Installed (new) during 2005-2006	In operation as on 31.03.06
1	ANDAMAN & NICOBAR ISLANDS	14	4	-	-	4
2	ANDHRA PRADESH	60	2	1	-	1
3	ARUNACHAL PRADESH	9	-	-	5	5
4	ASSAM	7	1	-	1	2
5	CHATTISGARH	3	2	-	-	2
6	GOA	1	1	-	-	1
7	GUJARAT	56	3	3	-	-
8	HARYANA	6	1	-	-	1
9	HIMACHAL PRADESH	9	-	-	-	-



10	JAMMU & KASHMIR	7	-	-	-	-
11	JHARKHAND	2	2	-	-	2
12	KARNATAKA	37	5	1	-	4
13	KERALA	25	4	2	-	2
14	LAKSHADWEEP	10	-	-	-	-
15	MADHYA PRADESH	30	5	2	-	3
16	MAHARASHTRA	87	15	4	-	11
17	MANIPUR	5	3	-	2	5
18	MIZORAM	5	3	-	2	5
19	ORISSA	10	-	-	-	-
20	PONDICHERRY	4	-	-	-	-
21	PUNJAB	11	-	-	-	-
22	RAJASTHAN	37	2	1	1	2
23	TAMIL NADU	61	6	4	-	2
24	TRIPURA	3	3	-	-	3
25	UTTARANCHAL	11	-	-	-	-
26	UTTAR PRADESH	2	2	2	-	-
27	WEST BENGAL	10	1	-	-	1
28	SIKKIM	3	-	-	3	3
	Total	525	65	20	14	59

The wind resource assessment programme is being implemented in the states with the active co-operation of State Nodal Agencies. Of the cumulative total of 525 stations established till 31.03.2006, 211 stations have been found to have Wind Power Density (WPD) in excess of 200 W/m² at 50 m. agl. Summary of these 211 stations are given in the Table-2.

WRA IN THE NORTH EAST REGION:

State wise details of the wind monitoring stations commissioned during 2005-2006 in the country under

WPD range [W/m ²]	Number of stations
200-250	78
250-300	62
300-350	31
350-400	14
>400	26

Table-2: WPD Distribution at the 211 stations

various programmes are given in the Table-3. All the masts are of 25 m. height. Sensors are placed at 25 m. and 10 m. levels.

**Table-3: State wise installations of wind monitoring stations
Established during 2005-2006**

S.No.	Stations established	State	District	Date of commissioning
1	Tolpoi	Assam	N. Cachar	05.04.2005
2	Likabali	Arunachal Pradesh	West Siang	01.04.2005
3	Raga		West Subansiri	27.04.2005
4	Simong		West Kameng	19.07.2005
5	Sela		West Kameng	10.06.2005
6	Rupa		Upper Siang	12.06.2005
7	Laimaton	Manipur	Churachandpur	01.05.2005
8	Dolangkhunou		Chandel	21.03.2006
9	Lunglei	Mizoram	Lunglei	16.06.2005
10	Mamte		Lunglei	18.06.2005
11	Asanthang	Sikkim	South Sikkim	03.10.2005
12	Gnathang		East Sikkim	06.10.2005
13	Thangu		North Sikkim	30.10.2005

SNAs & OTHER INSTITUTIONS

1. Data collection continued from the previous year at five wind-monitoring stations commissioned in the Latur and Sangli districts of Maharashtra under a programme with MEDA, Pune.
2. Data collection continued from the previous year at three wind-monitoring stations commissioned in the Konkan region of Maharashtra under a programme with MEDA, Pune.
3. Data collection from two wind monitoring stations continued in Madhya Pradesh under a programme with Maulana Azad Institute of Technology (MANIT), Bhopal. Final report on data collected from two the stations were prepared.
4. Wind measurements have been initiated at initiated at Midakanahalli, Gokak, Karnataka for M/s. Hutti Gold Mines Company (Fig.12).
5. At the request of M/s.MSPL wind monitoring studies have been initiated at T. B. Dam, Hospet for M/s. MSPL Limited.
6. Wind monitoring studies been initiated in A/N Island for NRSE, EB, Port Blair.



**Fig.12: 50m. tall Wind Monitoring Mast
at Midakanahalli, Karnataka**

**CONSULTANCY PROJECTS**

In addition to the wind monitoring projects, the unit has carried out 13 consultancy projects. These short-term projects were to provide micro-siting services and preparation of due diligence reports. Under direction

from the Ministry, verification of data collection procedure adopted by private initiatives was undertaken for a number of stations. Details of projects carried out during the financial year are given in Table-4.

Table-4: Consultancy projects taken up during 2005-2006

S.No.	Name of the Project	Name of the Client
1	Production estimate for NM48/750 NM54/950 wind turbines at GR Halli, Chitradurga in Karnataka	M/s. NEG Micon, Chennai
2	Micro-siting for wind farm at Kurumadhikere, Chitradurga District in Karnataka	M/s. Pioneer Wincon Private Ltd, Chennai
3	Preparing a DPR on wind diesel hybrid project for Lakshadweep Islands.	Department of Electricity, Union Territory of Lakshadweep
4	Micro Survey Studies at three wind monitoring stations in Tamilnadu	Tamilnadu Energy Development Agency (TEDA), Chennai.
5	Verification of procedure of wind monitoring & Estimation of wind generation at Anabooru, Karnataka	M/s. Indian Ocean Finance & Services Ltd Mauritius
6	Feasibility Study for wind farmable area at Kappatagudda Hills regions in Karnataka.	M/s. GMR Industries Limited, Hyderabad
7	Performance evaluation study of 2.50 MW wind power project at Narasimhakonda, Nellore, Andhra Pradesh	Non-conventional Energy Development Corporation of Andhra Pradesh Ltd., (NEDCAP), Hyderabad
8	Feasibility study for one machine at Aralvaimozhi Area, Kanyakumari District in Tamilnadu.	M/s. Aralvaimozhi Special Panchayat, Kanyakumari
9	Verification of Procedure of Wind Monitoring at Phalodi, Rajasthan (Extn.)	M/s. Suzlon Energy Ltd, Pune
10	Verification of procedure of wind monitoring at Bhalu Ratangad, Jodhpur Dist, Rajasthan	M/s. Suzlon Energy Ltd, Pune

11	Verification of procedure of wind monitoring at Soda Bandhan, Jaisalmer Dist, Rajasthan (Extn.)	M/s. Suzlon Energy Ltd, Pune
12	Appraisal of sites of Maharashtra Energy Development Agency (MEDA) and Micrositing in Sautada & Vijaydurg in Maharashtra.	M/s. Hindustan Petroleum Corporation Ltd. Mumbai
13	Consultancy Project for Establishing 5MW wind farm in Karnataka.	M/s. Bharat Petroleum Corporation Limited, Chennai

R & D PROJECTS (WRA)

1. Power Law Index Verification Programme:

The empirical relation that describes the effect of height on wind speeds is generally known as Power Law in the field of wind energy. The ratio of mean wind speeds at two heights is expected to be equal to the ratio of two heights to the power law index. The power law index can have large variations depending upon the terrain features and other atmospheric conditions. It is often used in Wind Energy Assessment where wind speeds at the height of a turbine (~50-70 m.) may have to be estimated from near surface observations (10 to 20 m.). Therefore determination of power law index and its verification for a vast region having similar roughness characteristics and weather pattern, measurement programmes were taken up in plains as well as hilly terrain. One 50m. tall mast with instrumentation at three levels was established in December 2005 at Khodal in the Barmer district of Rajasthan and the data is being collected. Data collection from the station at Kalunirkulam is also continued during the period.



Fig.13: 50m Tall Wind Monitoring Station at Khodal

2. Measure–Correlate–Predict (MCP) Method for Wind Resource Assessment:

C-WET has started a programme of Measure – Correlate – Predict (MCP) technique for wind resource assessment during the year 2004-2005.

The technique to estimate long-term wind climate is often referred as Measure –Correlate-Predication method. The basic idea is taking short-term measurements at the target point and correlating them with measurement at a nearby reference point where the measurements have been taken for longer periods. Under this programme a 50m tall mast with sensors at three levels was commissioned at Majlatti near Chikkodi reference wind monitoring station in Karnataka was closed down in March 2006 after collecting required data and report is under preparation. The experiment has the aim of validating the procedures and techniques.



Fig.14: Wind Monitoring Tower at Neendakara

3. Offshore Wind Resource Assessment:

Two stations commissioned in the Kerala Coast viz. Vizhinjam and Neendakara were closed down during the period and report is under preparation.





WIND TURBINE TESTING

Development of Wind Turbine Test Station

Over a five year period, C-WET has developed its own Wind Turbine Test Station (WTTS) of international standards near Kayathar, in Tamil Nadu, with the technical assistance of RISO National Laboratory, Denmark under DANIDA grant and with the financial assistance and guidance of Ministry of Non - Conventional Energy Sources. This Test Station has the following facilities :

- Two test beds to test wind turbines up to 1250kW capacity and 400kW capacity and the capacity expandable based on future offers.
- Readily available grid connection for each test bed.
- Readily available reference met masts in front of each test beds, which are designed up to a height of 75 meters and 50 meters.
- Availability of Industrial PC based data acquisition systems for measurements at the control rooms of each test bed.
- Office-cum-workshop building at WTTS with facilities of carrying out functionality checks of instruments and various sensors. The workshop is equipped with adequate space to accommodate nacelles for instrumentation purposes. The equipments / instruments used for various measurement projects are stored in the workshop as per quality management system.

Testing Programmes

The Provisional Type Testing (PTT) programme of Pawan Shakthi 600 kW at Senjuvadi, Pollachi Taluk, Tamilnadu of M/s Vestas RRB Ltd, Chennai continued during 2005. After completion of the measurements during September 2005, analysis has been carried out and reports were delivered to the client.



Fig.15: Instrumentation for Pawan Shakthi 600kW PTT at plant

The PTT programme of Enercon 800 kW at Bamnasa, Jamnagar District, Gujarat of M/s Enercon India Ltd, Mumbai started during 2005. After completion of the measurements during December 2005, analysis has been carried out and reports are under finalization.

A field testing (power performance measurements) of NEG-Micon 950 kW at Chitradurga, Karnataka has been carried out for M/s NEG-Micon India Ltd., Chennai. In connection with this measurement

programme a site calibration was also carried out. The measurements were closed and analysis was carried out. The report was issued to the client.

Suzlon's works at Pondicherry. The blade, nacelle, tower and control panel instrumentation were carried out at WTTS Test Bed – A.



Fig.16: Measurements at Chitradurga for NEG-Micon 950 kW field testing



Fig.17: Strain gaging in main shaft of Suzlon 600 kW turbine for its PTT programme

During the windy season of the year 2005, the testing unit of C – WET started PTT on Suzlon 600 kW wind turbine of M/s Suzlon Energy Ltd., Pune. The test engineers carried out factory instrumentation at

M/s India Wind Power Ltd. is expected to erect Nordex 250 kW at Test Bed – B for provisional type testing programme. In connection with this an agreement is already executed.

Test and measurements carried out in Testing Unit

YEAR	TEST	WIND TURBINE
2005	Provisional Type Test at Senjuvadi, Pollachi, Tamilnadu	600 kW, 47m rotor diameter of Pawan Shakthi make
2005	Provisional Type Test at Bamnasa, Jamnagar, Gujrat	800 kW, 48m rotor diameter of Enercon make
2005	In-Situ Power Performance at Chitradurga, Karnataka	950 kW, 52m rotor diameter of NEG-Micon make
2005	Provisional Type Test at WTTS	600 kW, 52m rotor diameter of Suzlon make
2004	Provisional Type Test at Govindhapuram, Dharapuram, Tamilnadu	600 kW, 48m rotor diameter of Enercon make
2003	In-situ Power Performance (Kapatguddah Hills, Karnataka)	230kW, 30m rotor diameter of Enercon make
2003	In-situ Power Performance near Jaisalmer, Rajasthan	1000kW, 62 m rotor diameter of Suzlon make
2002/2003	Provisional Type Test at WTTS	250kW, 29.6m rotor diameter of TTG make



2002 / 2003	Provisional Type Test at WTTS	1250kW, 64 m rotor diameter of Suzlon make
2002	In-situ Power Performance near Muppandal	750kW, 48 m rotor diameter NEG-Micon make
2001	Provisional Type Test at WTTS	225kW, 29.6 m rotor diameter of NEPCmake
2001	Provisional Type Test at WTTS	1000Kw, 60 m rotor diameter of Suzlon make
2000	Provisional Type Test at WTTS	350Kw, 33.4 m rotor diameter of Suzlon make
2000	Provisional Type Test at WTTS	500kW, 47 m rotor diameter of Vestas make
1999	In-situ Power Performance near Coimbatore	250kW 29.7 m rotor diameter BHEL make
1999	In-situ Power Performance near Muppandal	500kW 39 m of rotor diameter of Vestas make

Quality Management System and NABL Accreditation

As a part of quality management system, testing unit is certified as per the requirements of ISO 9001:2000 standard. Testing unit aims at getting its accreditation as per the requirements of ISO 17025:2005 from National Accreditation Board for Testing and Calibration Laboratories, New Delhi. A Pre-audit by lead assessors appointed by NABL resulted in suggestions for system improvement in the areas of calibration & tightening up procedures. Preparation

for accreditation audit is completed. The evaluation is expected to be taken up during ensuing windy season. Several internal audits were also conducted as per ISO 17025:2005 at WTTS, Kayathar and Testing Unit, Chennai.

C-WET has been in touch with MEASNET, an informal but powerful group of measurement laboratories for recognition. This is an essential part of international acceptance of C-WET's measurements.





STANDARDS & CERTIFICATION

The wind power development in India has seen a rapid growth in the recent past and the wind turbine installed capacity in India is one of the top four countries in the World. Energy generation from the renewable energy sources, especially wind power is expected to play an active role in meeting the energy needs of the country. With large scale deployment of Wind Turbines it becomes necessary to take quality aspects of the hardware very seriously to ensure sustained growth of the Indian wind industry.

The Indian Type Certification Scheme for wind turbines, viz., Type Approval – Provisional Scheme

(TAPS-2000) has been formulated in line with International standards (IEC), while taking into account of the Indian conditions. TAPS – 2000 has been approved & issued by MNES. Standards and Certification unit is implementing TAPS-2000 for type certification of wind turbines in India. The renewal of certificates is also being carried out by Standards and Certification unit.

Standards and Certification unit plays a key role in preparation of Indian standards on wind energy.

ACTIVITIES

PROVISIONAL TYPE CERTIFICATION

Completed Projects

Provisional Type Certificate Issued (2005 –2006)

S.No	Manufacturer's Name	WT Model/Capacity	Status
1	Chiranjeevi Wind Energy Limited	C2920 – 250kW	Category - I Certificate issued. Valid up to 30.09.2006.
2	Pioneer Wincon India Private Limited	W250/29 – 250 kW	Category - I Certificate issued. Valid up to 31.03.2007.

On-going Projects

Provisional Type Certification-Status of Category I Projects (2005 –2006)

S.No	Manufacturer's Name	WT Model/Capacity	Status
1.	NEPC India limited Private Limited	NEPC-225 kW with 50m tubular tower	On going



Fig.18: Shri. V. Subramanian, Secretary, MNES presenting the Provisional Type Certificate of C2920/250kW wind turbine model to Chiranjeevi Wind Energy Limited



Fig.19: Certification Agreement signing between SUZLON Energy Limited & C-WET

Provisional Type Certification-Status of Category-II Projects (2005–2006)

S.No	Manufacturer's Name	WT Model/Capacity	Status
1.	Vestas RRB India Limited	Pawan Shakthi-600kW	On going
2.	NEPC India Limited	NEPC-NORWIN-ASR-46/47-600/750 kW	On going
3.	Enercon (India) Limited	Enercon E48/800kW	On going
4.	Suzlon Energy Limited	Suzlon S70/1250 kW	On going

Provisional Type Certification-Status of Category-III Projects (2005–2006)

S. No	Manufacturer's Name	WT Model/Capacity	Status
1.	TTG Industries Limited	TTG-250kW	On going
2.	Suzlon Energy Limited	Suzlon 600 kW	On going
3.	India Wind Power Limited	I-29/250 / 250 kW	On going

Provisional Type Certification – RENEWAL (2005–2006)

S. No	Manufacturer's Name	WT Model/Capacity	Validity
1.	NEPC India Limited	225 kW	14.05.2006
2.	Vestas RRB India Limited	V39-500 kW with 47 m rotor diameter – 500 kW	20.04.2006
3.	NEG MICON Limited	NM 48/750 – 750 kW	Completed
4.	Suzlon Energy Limited	N3330/3335 – 300/350 kW	On going



Indian Standards on Wind Turbine Certification

C-WET had prepared and submitted three National Application Documents for corresponding International Standards viz. IEC WT 01, IEC 61400 – 1 and IEC 61400 – 12 to BIS. As per the suggestion from BIS, C-WET has combined the National Application Documents and corresponding IEC standards and submitted as three draft Indian standards.

C-WET is nominated as the convener of the working group on wind energy by BIS. C-WET has formulated a working group and initiated actions to hold the first working group meeting to discuss on the draft Indian standards.

List of Wind Turbine Manufacturers / Wind Electric Equipment

The Committee meeting on the List of Manufacturers of Wind Electric Generators / Wind Turbine Equipment has been held to verify the documentation provided by the manufacturers and to recommend the list of Wind Turbine models and Manufacturers.

One list of Wind Turbine Manufacturers / Wind Electric Equipment has been issued during September 2005.

Type Approval System (TAS)

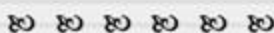
The draft Type Approval System (TAS) has been formulated in consultation with RISO National Laboratory, Denmark and the same has been submitted to MNES for approval.

QMS ISO 9001: 2000

C-WET has been certified for ISO 9001:2000 by DNV. The first surveillance audit has been successfully carried out by DNV.

Development of Software for issuing Concessional Customs Duty Certificate

Development of prototype software to help in preparing Concessional Customs Duty Certificate (CCDC) for MNES was undertaken by S&C unit through M/s. National Informatics Centre, Chennai. All the concerned industries were consulted in a day long meeting to discuss the modalities. Inputs received have been discussed with programmers for implementation. The software development is completed and is to undergo trials in the ministry.



INFORMATION, TRAINING AND COMMERCIAL SERVICES

The Information, Training and Commercial Services (ITCS) unit carried out the following activities during the year 2005 – 2006.

International Training

The Information, Training and Commercial Services unit successfully organized the Second International training course on “**Wind Turbine Technology and Applications**” during 22nd February - 3rd March 2006 sponsored by the Ministry of Non-Conventional Energy Sources, Government of India. The objective of the training course was to transfer knowledge and special skills needed by the wind energy personnel working in the technical and operational fields and to share the lessons learnt over the last two decades.



Fig.20: Participants in front of C-WET Campus

The course received a total of twenty one enthusiastic participants from China, Iran, Sri Lanka, Cuba, Saudi Arabia, Mauritius, Yemen, Uganda, Bangladesh and Thailand.



Fig.21: Shri. V. Subramanian, Secretary, MNES inaugurated the training course

The course provided an invaluable platform for dialogue and open exchange of views and experiences. The course content for the training was a carefully thought out syllabus with subject experts giving lectures and quoting specific case studies.



Fig.22: Participants at field visit - Muppandal, Tamil Nadu

As part of the training programme the participants were taken to WTTS, Kayathar and various wind farms in Aralvaimozhi pass. Visits to manufacturing facilities were organized during the course to give a complete picture of the know-how.



Fig.23: Participants in front of Wind Turbine Test Station



Fig.25: Dr. T. Ramasami, Director, CLRI, handing over participation certificate

To make the training more interactive, the course participants were asked to make a presentation on “Country Policies and Perspective on Wind Energy”, summarizing the learning at the training programme and their vision ahead.



Fig.24: Participants visiting manufacturing facilities

Dr. T. Ramasami, Director, Central Leather Research Institute, Chennai chaired the valedictory function and distributed the certificate to the participants.

National Training

Third National Training: The Third National Training Programme on “WIND FARM DEVELOPMENT AND RELATED ISSUES” was organised on 1st and 2nd September 2005. The course focused on the general introduction to the wind turbine technology, characteristics of wind resources, wind farm design methodology and certification & testing related issues.

Shri. Vilas Muttemwar, Honorable Minister of State (Independent Charge), MNES, Inaugurated the well-received training programme with fifty participants.



Fig.26: Hon. Minister, MNES inaugurated the training course



The programme was designed to cater to the needs of decision makers, project managers, scientists, engineers, project developers and project evaluators.



Fig.27: Training participants in front of C-WET office

Training on Wind Resource Assessment

A Training programme on “Handling of Wind Measuring Instruments and Operation & Maintenance of Wind Monitoring Stations for the State Nodal Agencies of North East Region” on 9th – 12th January 2006. A total of 6 participants from 5 States participated in the programme.

On the first two days of the programme at C-WET, lectures on various aspects of wind resource assessment with respect to North East region, testing of wind turbines, need for standard and certification for the wind turbines, micro siting, recent developments and trends in wind energy, handling of wind monitoring equipments and operation & maintenance of wind monitoring stations were taken by C-WET faculty on the first two days. A “hands on” on the wind monitoring equipment with emphasis

on memory device collection and battery replacement was arranged in the WRA Laboratory. A field visit was also a part of the programme and the participants were taken to the C-WET test facility at WTTS Kayathar and to the wind farms at the Shenkottah Pass and Aralvaimozhi.



Fig.28: Training for NE State Nodal Agencies in progress

C-WET Video Film

A fifteen minute video is being prepared to highlight the achievements of C-WET and show case services offered by C-WET. It is expected that the film would be ready for release by May 2006.

Bilingual Website

In order to cater for a wider public the website of C-WET has now been made bilingual. The user has the choice to obtain information in Hindi or in English.

Newsletter

C-WET brings out its well received quarterly newsletter “PAVAN” regularly to disseminate relevant and topical information on wind energy developments as well as the activities of the Centre. The “PAVAN”



highlights the happenings, accomplishments, endeavors of C-WET and carries focused articles, success stories, new rules and policies of Government, and the latest news & views.

Library Automation

Online Public Access Catalogue (OPAC):

C-WET Library is being strengthened by adding books and periodicals allied to Wind Energy in particular and renewable energy in general. To maintain the Library resources and offer the services effectively C-WET Library has been computerized by using Library Automation software. Now, users can easily identify the availability & status of the library resources (books and periodicals) through **Online Public Access Catalogue @ <http://library/cwet>**.

Book Release

Shri. Vilas Muttemwar, Honorable Minister of State (Independent Charge), Ministry of Non-Conventional Energy Sources, Government of India released the book titled, "WIND ENERGY RESOURCE SURVEY Volume VII" containing wind energy resource data collected from 26 stations on 1st September 2005. It was released on the occasion of the inauguration of 3rd National Training Course. Data from Tamil Nadu, Karnataka, Andhra Pradesh, Maharashtra, Madhya Pradesh and Gujarat, are presented in the book.

Award of Centre of Excellence

Centre for Wind Energy Technology has been awarded the "SESI Special Award to Centre of

Excellence" by the Solar Energy Society of India. Shri. Vilas Muttemwar, Honorable Minister of State, (Independent Charge) conferred the award on C-WET during inauguration of ICORE-2006 on 08th February 2006 held in the Hyderabad International Convention Centre, Hyderabad.



Fig.29: SESI Special Award to Centre of Excellence C-WET

Hindi day celebrations

"Hindi Diwas" was celebrated on 21st September 2005 at the Conference Hall of Centre For Wind Energy Technology. Chairman, Hindi Promotion Committee, C-WET extended a warm welcome and delivered an introductory note. Shri. Rajesh Katyal, Unit Chief, R & D and Member-Secretary of Hindi Promotion Committee, C-WET presented a detailed report on implementation of Hindi in C-WET.

Essay writing and Hindi speaking competitions were conducted for the employees of C-WET. The Chief Guest, Shri. J. L. Sharma, Senior Hindi Officer, CLRI, Chennai delivered keynote address and explained the importance of promotion of Hindi, the National



Language. He also reiterated the need of providing Hindi training for C-WET officials. The Chief Guest distributed the prizes to the successful participants. The meeting concluded with a Vote of Thanks by Shri. N. S. Prasad.

Selected Lectures in Conference and Seminars

M. P. Ramesh, Executive Director

- ❑ Chief Guest for the Valedictory of National Level Technical Symposium, 11th March 2005, RMD Engineering College, Kavaraipettai.
- ❑ National Seminar on Renewable Energy and Energy Management, 23rd - 24th August 2005, Tezpur.
- ❑ “Wind Power Resource Assessment and Technology”, BIMSTEC Expert Group Meeting on Renewable Energy Development Project, 15.09.2005 & 16.09.2005, New Delhi.
- ❑ Keynote address at the Workshop on “Integration Issues of Wind Farm & Grid”, 28th September 2005, Central Power Research Institute, Bangalore.
- ❑ Keynote address at the inaugural session of the “Conference on Wind Energy : Trends & Issues”, National Institute of Technical Teachers’ Training and Research, Bhopal. Also member of the Advisory Committee. Presented a Paper “Wind Energy Utilization – Retrospect and Prospects”, 5th & 6th January 2006.

- ❑ Esteemed Speaker in “Genesis” Symposium at 93rd Indian Science Congress and made a presentation on “Role of Wind Energy for Rural Applications”, 6th January 2006.
- ❑ Presentation on “Wind Energy Scenario in the Country” in ICORE 2006, 9th February 2006.
- ❑ Chaired the Panel Discussion during the Seminar on Wind Power Evacuation Solutions, Indian Wind Power Association, Chennai, 15th March 2006.
- ❑ Chief Guest for the National Level Workshop on “Emerging Energy Scenario Technological Options”, Misrimal Nagajee Munoth Jain Engineering College, Chennai, 24th March 2006.

Research & Development

Rajesh Katyal, Unit Chief

- ❑ “Foundation Design Concepts for Wind Turbine Applications”, National Training Programme, C-WET, Chennai.
- ❑ “Towers and Foundation Concepts”, Second International Training Programme, C-WET, Chennai.

K. Boopathi, Scientist

- ❑ “Wind Energy Technology & Applications” at Kongu Engineering College, Erode.
- ❑ “Wind Energy Technology”, Kumaraguru college Engineering, Coimbatore.



- ❑ "Introduction to wind energy Technology", BPCL, Chennai.
- ❑ "Energy Efficiency, Self sufficiency and Energy security in Wind energy", Kumaraguru College of Engineering, Coimbatore.
- ❑ "Wind power potential tapping in Tamil Nadu - case study", MNM Jain College, Chennai.
- ❑ "Development & related issues", 01.09.2005, C-WET, Chennai.
- ❑ "Opportunities for Setting up wind mills in exploited areas in Tamilnadu", Business Meet on Wind Energy, TEDA, 30.12.2005.
- ❑ "Wind Resource Assessment with respect to NE region", Training programme on "Handling of Wind Measuring Instruments and Operation & Maintenance of Wind Monitoring Stations for the State Nodal Agencies of North East Region", 09.01.2006, C-WET, Chennai.

S. Suresh Babu, Technician

- ❑ "Power Evacuation Challenges and Modeling Needs", 15.03.2006, Indian Wind Power Association, Coimbatore.
- ❑ "Power Quality issues of Wind farm", National Training Programme on Wind Farm related issues, 01.09.2005, C-WET, Chennai.
- ❑ "Wind Measurement and Instrumentation", second International Training Program on "Wind Turbine Technology and Applications", 22.02.2006, C-WET, Chennai.
- ❑ "Wind Resource Assessment", Training Program 04.03.2006, Indian Wind Power Association, Bangalore.

Wind Resource Assessment

E. Sreevalsan, Unit Chief

- ❑ "Wind Farm Layout & Production Estimate", third National Training Programme on "Wind Farm Development & related issues", 01.09.2005, C-WET, Chennai.
- ❑ "Wind Structure and Statistics", second International Training Program on "Wind Turbine Technology and Applications", 22nd February 2006, C-WET, Chennai.

R. Sasikumar, Meteorologist

- ❑ "Wind Resources and Measurement", third National Training Programme on "Wind Farm

Wind Turbine Testing

S. A. Mathew, Unit Chief in charge

- ❑ "Power curve Measurements", second International Training Program on "Wind Turbine Technology and Applications", 22.02.2006 to 03.03.2006, C-WET, Chennai.

R. Kumaravel, Scientist

- ❑ "Mechanical Loads", second International Training Program on "Wind Turbine Technology and Applications", 22.02.2006 to 03.03.2006, C-WET, Chennai



J. C. David Solomon, Scientist

- “Safety and Function Test”, second International Training Program on “Wind Turbine Technology and Applications”, 22.02.2006 to 03.03.2006, C-WET, Chennai

Standard and Certification

A. Senthil Kumar, Unit Chief in charge

- “Certification of Wind Turbines – as per TAPS – 2000”, Third National Training Program on Wind farm development and related issues, C-WET, Chennai.
- “Certification of Wind Turbines”, Business Meet on Wind Energy for the Textile and other industries, TEDA and IREDA, Coimbatore.
- “Type Certification of Wind Turbines”, second International Training Program on “Wind Turbine Technology and Applications”, C-WET, Chennai.

Gireesh Kumar V. R, Scientist

- “Basic Aerodynamics”, third National Training Program on Wind farm development and related issues”, C-WET, Chennai.

S. Arulselvan, Technician

- “Wind Turbine Safety Systems and Types of Generators”, second International Training Program on Wind Turbine Technology and Applications”, C-WET, Chennai.

S. Siva Kumar, Scientist

- “Basic Aerodynamics for Wind Turbines”, second International Training Program on Wind Turbine Technology and Applications, C-WET, Chennai.

Conferences, Meetings & Training attended by C-WET Staff

Research & Development

- Rajesh Katyal and S. Suresh Babu, training programme on “Certified Internal Audit Training Course of ISO 9001:2000, DNV, Chennai, 26th & 27th August 2005.
- Rajesh Katyal, Deepa Kurup, and S. Suresh Babu, training programme on “Certified Internal Audit Course of ISO/IEC 17025 – 2005, Smt. Rajyalakshmi Subramaniam, 21st & 22nd December 2005.
- S. Suresh Babu, workshop on “Integration issues of wind farm and grid”, 28.09.2005, Central Power Research Institute, Bangalore.
- Deepa Kurup and S. Suresh Babu, Seminar on “Power Quality Monitoring – The New Perspective”, 08.02.2006, Chennai, Fluke & Technical Trade Links Pvt. Ltd., and Elmack Engineering Services, Chennai
- Deepa Kurup, Seminar on “LXI is the Future of Test”, 18.01.2006, Agilent Technologies, Chennai.
- K. Boopathi, Deepa Kurup and S. Suresh Babu, Seminar on “Transducers and Conditioning for



Sound and Vibration Signal 04.07.2005, Josts Engineering Company Ltd, Chennai.

- ❑ K. Boopathi, one week programme on “Composite Technology”, Vellore Institute of Technology, Vellore.

Wind Resource Assessment

- ❑ Siddarth Shankar Das, Scientist, WRA “VHF Radar Observations of Temperature Sheets in the Stratospheric-Tropospheric Region” 9th – 12th February 2006, XIV National Space Science Symposium (NSSS-2006), sponsored by Indian Space Research Organization (ISRO), Andhra University, Visakhapatnam.
- ❑ Siddarth Shankar Das, Scientist, WRA “VHF Radar echoes in the vicinity of Tropopause during the passage of Tropical Cyclone”, 9th – 12th February 2006, XIV National Space Science Symposium (NSSS-2006), sponsored by Indian Space Research Organization (ISRO), Andhra University, Visakhapatnam.

Wind Turbine Testing

- ❑ Testing Unit Staff, Training Programme of NABL internal Auditors Training course, M/s. Rajalakshmi & Co NABL, 20th & 21st December 2005.
- ❑ R. Kumaravel, training on data Acquisition Unit, M/s. Agilent Technologies India, 18.01.2006.

Standards & Certification

- ❑ S. Arulselvan attended training course on “Internal Quality Audit according to the standard ISO 9001:2000” conducted by DNV during 26 – 27 August 2005.
- ❑ S&C unit staff members attended training course on “Refresher course on Internal Audit according to the standard ISO 17025” during 21 – 22 December 2005.

Information, Training and Commercial Services

- ❑ P. Kanagavel, Training programme on “2nd Indo-Australian Conference on “IT Security IACITS 2006”, 16th and 17th January 2006, The Indian Institute of Technology Madras, Chennai.

Administration

- ❑ K. Tamilselvi, 3 days special Programme on Reservation Policy, 22 – 24 August.2005, Centre for Training and Development, Bangalore.
- ❑ K.V. Uma Maheswara Rao, 3 days Technical Workshop on “Cash & Accounts Management”, 07 – 09 July 2005, Institute of Socio Economic Research & Action (ISERA), New Delhi.
- ❑ D. Lakshmanan, 3 days Technical Workshop on purchase policy and procedure in Govt. Departments, 12 – 14 August.2005, Centre for Training and Social Research, New Delhi.



- ❑ M. R. Gunasekaran, 3 days Technical Workshop on “Effective Private Secretaries / Personal Assistants and Office Staff”, 06 - 08th October 2005, Institute of Socio Economic Research & Action (ISERA), New Delhi.
- ❑ R. Girirajan, 2 days workshop on Inventory and Stores Management, 17 – 18 November, 2005, Management Study Centre, Chennai.

Publications

International Publications

- ❑ Siddarth Shankar Das, et al “Observations of extremely low tropopause temperature over the Indian tropical region during monsoon and post-monsoon months: Possible implications”, Journal of Geophysical Research (American Geophysical Union), 111, 2006.

National Publications

- ❑ M. P. Ramesh, Executive Director, “Indian Wind Turbine Certification System – Past, Present and Future”, Directory Indian Wind Power 2005, 5th Edition page no. 1-19 to 1-27.
- ❑ E. Sreevalsan, Unit Chief, WRA, “Weibull Parameters Estimation – A Comparison of different methods”, Wind Engineering, Vol.29, Page No.3, May 2005.

Vigilance Awareness Week

Vigilance awareness week was observed in C-WET during November 2005. The observance of the week was commenced with the “Pledge” administered by ED, C-WET followed by reading of message received from Central Vigilance Commission.

Implementation of Reservation Policy for SC, ST & OBC

C-WET strictly follows Govt. of India Rules prescribed for Recruitment and appointment for various posts. All the posts are filled as per Post Based Reservation Roster of Govt. of India. Grouping of various posts in direct recruitment for maintaining rosters with pay scales is being done as per Govt. of India Rules. Liaison Officers are appointed for OBC, SC & ST Separately. Reservation Roster is being signed by them every year. No de-reservation has been made till date. No grievances or complaints of harassment from OBC, SC & ST candidates have been reported.

Out of the sanctioned strength of 40, C-WET has staff strength of 31 as on date. Two posts filled by SC candidates as per the cadre strength of respective category. As per Reservation Roster for Direct Recruitment, the Roster Point for ST Starts once the number of sanctioned posts touches 14. Since the sanctioned strength in each cadre is below 7 or less no ST candidate has been appointed.





C-WET officials on external Committees / Membership of Associations / Bodies

M. P. Ramesh

1. ANERT Governing Body
2. Sectional Committee ME-04 of Bureau of Indian Standards, New Delhi.
3. Monitoring Committee, NMITLI Project, CSIR, New Delhi.
4. Consultative Group on Wind Power constituted by MNES, New Delhi to review and consolidate the guidelines for wind power projects.
5. Sub-Group on Wind, Renewable Energy Council, Confederation of Indian Industry, CII-Sohrabji Godrej Green Business Centre, Hyderabad
6. Group of Experts on Engineering and Communications constituted by National Centre for Antarctic and Ocean Research, Goa.
7. Wind Sector Committee for Project Cost reduction constituted by IREDA, New Delhi.
8. Technical Committee constituted by Central Board of Irrigation and Power, New Delhi to scrutinize the papers of the First International Conference on "Renewable Energy".
9. Aeronautical Society of India.
10. International Solar Energy Education (affiliated to ISES)

N. S. Prasad

1. Solar Energy Society of India, Member.

2. Non-Conventional Energy Sources Sectional Committee ME04 of Bureau of India Standards (BIS), Member.

3. Wind Energy Sub-Committee ME04:4 of BIS, Member.

D. Lakshmanan

1. National Institute of Personnel Management, Kolkata, Corporate Member.

Rajesh Katyal

1. Institution of Engineers (India), Member.

E. Sreevalsan

1. Indian Meteorological Society, Member
2. Doctoral Committee (Academic Research), Sathyabama Deemed University, Chennai, Member.
3. Committee Member of Evaluation RFQ & RFP Bid Committee (Wind farms in Kerala)

A. Senthil Kumar

1. Wind Energy Sub-Committee ME04: 4 of BIS, Member.

V. R. Gireesh Kumar

1. Institution of Engineers (India), Associated member.
2. Indian Institute of Metals, Associated member.

R. Kumaravel

1. Institution of Engineers (India), Associated member.



GENERAL INFORMATION

Committees

Governing Council

The following are the members of the Governing Council & Annual General Body (To administer and guide the affairs of the Centre):	
1	Shri V. Subramanian, Secretary, MNES, New Delhi, Chairman
2	Dr. V. Siddhartha, Chairman, R&D Council, C-WET, Consultant, Ministry of External Affairs (Formerly Outstanding Scientist, DRDO, Ministry of Defence, New Delhi), Member
3	Shri. A. K. Rath, Additional Secretary & Financial Adviser, MNES, New Delhi, Member
4	Shri. R. Satapathy, Principal Secretary to Govt., Energy Department, Govt. of Tamil Nadu, Secretariat, Chennai, Member
5	Shri S. P. Sharma, Director General, Bureau of Indian Standards, New Delhi, Member
6	Shri V. S. Verma, Member (Planning), Central Electricity Authority, New Delhi, Member
7	Shri. Debashish Majumdar, Managing Director, IREDA, New Delhi, Member
8	Dr. A. R. Upadhyaya, Director, National Aerospace Laboratories, Bangalore, Member
9	Dr. Kota Harinarayana, Raja Ramanna Fellow, Director's Secretariat, National Aerospace Laboratories, Bangalore, Member
10	Shri. K. P. Sukumaran, Scientist 'G' & Head, Wind Energy Group, MNES, New Delhi, Member
11	Shri. Ramesh Kymal, Chairman, Chairman, IWTMA, Chennai, Member
12	Shri. M. P. Ramesh, Executive Director, C-WET, Chennai, Member Secretary

Management Committee

The following are the members of the Management Committee (To take decisions as and when required and to inform GC from time to time):	
1	Chairman, Governing Council, C-WET
2	Financial Adviser, MNES
3	Executive Director, C-WET

Finance Committee

The following are the members of the Finance Committee (To review the financial performance of the Centre):	
1	Shri. A. K. Rath, Additional Secretary & Financial Adviser, MNES, Chairman
2	Shri. R. Satapathy, Special Commissioner & Secretary to Govt., Energy Department, Tamil Nadu Government, Member



3	Shri. K. P. Sukumaran, Adviser & Head, Wind Energy Group, MNES, Member
4	Shri. R. P. Sharma, Director (WE), MNES, New Delhi, Member
5	Shri V. Jayachandran, Director (Finance), MNES, New Delhi, Member
6	Shri. M. P. Ramesh, Executive Director, C-WET, Chennai, Member
7	Shri. D. Lakshmanan, General Manager (F&A), C-WET, Member Secretary

Standards Advisory Committee

The following are the members of the Standards Advisory Committee (To guide C-WET in evolving strategies and planning in preparation of Indian Standards for wind turbines):	
1	Deputy Director General, BIS, Southern Regional Office, Chennai
2	Representative of IWTMA
3	Representative of WINDPRO
4	Mr. T. B. Chikkoba, Consultant
5	Representative of SEB (TNEB)
6	Mr. P. T. Kumar, Joint Director BIS, Southern Regional Office, Chennai
7	Mr. J. P. L. N. Sastry
8	Mr. A Senthil Kumar, Engineer, C-WET
9	Mr. N. S. Prasad, Unit Chief, S & C, C-WET

Research and Development Council

The following are the members of the Research and Development Council (To guide C-WET on laying down Research direction to serve the Indian Wind energy Sector):	
1	Dr. V. Siddhartha, Consultant, Ministry of External Affairs (Formerly Outstanding Scientist, DRDO, Ministry of Defence) New Delhi, Chairman
2	Shri. K. P. Sukumaran, Scientist 'G', Advisor, Wind Power, MNES, New Delhi, Member
3	Prof. Sujay Basu, Professor (Retd.), Jadavpur University, Kolkata, Member
4	Ms. K. A. Fathima, Additional Director & Head, Power Electronic Group, C-DAC (Formerly ER & DCI), Trivandrum, Member
5	Dr. A. Rama Mohan Rao, Scientist Gr. IV(4), Structural Engineering Research Centre, Chennai, Member
6	Dr. Vidyadhar Mudkavi, Scientist, Computational and Theoretical Fluid Dynamics Division, National Aerospace Laboratories, Bangalore, Member
7	Dr. G. B. Pant, Director (Retd.), Indian Institute of Tropical Meteorology, Pune, Member
8	Shri. J. P. L. N. Sastry, Ex. G. M. & Head, R&D, BHEL & Ex. OSD of C-WET, Hyderabad, Member
9	Shri L. E. D'Cruz, Advisor, Enercon (India) Limited, Andheri (West), Mumbai, Member
10	Shri. M. P. Ramesh, Executive Director, C-WET, Chennai, Member-Secretary

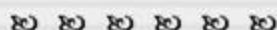


Syllabus Committee

The following are the members of the syllabus committee (To prepare syllabus and design courses on wind energy for master's degree):	
1	Prof. Sujay Basu, Director, School of Energy Studies, Jadavpur University, Kolkata, Chairman
2	Mr. M. P. Ramesh, Executive Director, Centre for Wind Energy Technology, Chennai, Member
3	Dr. N. Siva Prasad, Professor, Machine Design Section, Dept. of Mech. Engineering IIT, Chennai, Member
4	Dr. Bh. Nagabhushana Rao, Professor, Structural Engineering Division, Anna University, Chennai, Member
5	Dr. C. Chellamuthu, Professor & HOD, Electronics & Communication Engineering and Dean, R & D and Consultancy, Jeruselam College of Engineering, Chennai, Member
6	Dr. R. Rudramoorthy, Professor, Mechanical Sciences, PSG College of Technology, Coimbatore
7	Mr. Sarvesh Kumar, Chairman, IWTMA, Chennai, Member
8	Dr. K. K. Sasi, Reader, Department of Energy, Tezpur University, Tezpur, Sonitpur, Assam, Member
9	Mr. K. C. Dhimole, Principal Engineer & Head, WRA & ITCS, C-WET, Chennai, Member Secretary

Hindi Promotion Committee

The following are the members of the Hindi Promotion Committee (It constituted for the purpose of promotion of Hindi Official Language in C-WET):	
1	Mr. M. P. Ramesh, Executive Director, Chairman
2	Mr. Rajesh Katyal, Unit Chief, Member Secretary
3	Mr. K. V. Uma Maheswara Rao, Admin & Accounts Officer, Member
4	Mr. P. Kanagavel, Scientist, Member
5	Mr. R. Kumaravel, Junior Engineer, Member
6	Mr. S. Suresh Babu, Technician, Member





Centre for Wind Energy Technology, Chennai

HUMAN RESOURCE

M. P. Ramesh, Executive Director

Research & Development

Rajesh Katyal, Unit Chief
K. Boopathi, Scientist
Deepa Kurup, Junior Engineer
S. Suresh Babu, Technician

Wind Resource Assessment

E. Sreevalsan, Unit Chief
E. Siddarth Shankar Das, Scientist
R. Sasikumar, Meteorologist
T. Arivukkodi, Technician
K. A. Haji Abdul Ibrahim, Attendant

Wind Turbine Testing

S. A. Mathew, Unit Chief In-Charge
M. Anvar Ali, Scientist
J. C. David Solomon, Scientist
R. Kumaravel, Junior Engineer
M. Karuppuchamy, Technician
A. R. Hasan Ali, Technician
Y. Packiyaraj, Technician

Standards and Certification

N. S. Prasad, Unit Chief
A. Senthil Kumar, Unit Chief In-Charge
V. R. Gireesh Kumar, Scientist
S. Sivakumar, Junior Engineer
S. Arulselvan, Technician
M. R. Gunasekaran, Steno

Information, Training and Commercial Services

P. Kanagavel, Scientist

Administration

D. Lakshmanan, General Manager (F&A)
K. V. Uma Maheswara Rao, Admin & Accounts Officer
R. Girirajan, Assistant
R. Vijayalakshmi, Assistant
K. Tamilselvi, Assistant
B. Muthulakshmi, Steno
M. Malaravan, Driver
M. Selvakumar, Attendant





Centre for Wind Energy Technology, Chennai

AUDITORS REPORT

R. JANAKIRAMAN & CO.

Chartered Accountants

Partners

R. Janakiraman, B.Com., F.C.A.,	C. Shanmukham, B.Com., F.C.A.,
J. Chandrasekaran, B.Sc., F.C.A.,	B. Chandran, B.Com., F.C.A.,
C. Geetha, B.Com., A.I.C.W.A., F.C.A. D.I.S.A.	K. Chandramouli, B.Sc., F.C.A., M.S., MBIM(UK), D.I.S.A

AUDITOR'S REPORT TO THE MEMBERS OF THE GOVERNING BODY OF CENTRE FOR WIND ENERGY TECHNOLOGY, CHENNAI-601 302

We have audited the attached Balance sheet of Centre For Wind Energy Technology (C-WET) Velachery - Tambaram Main Road, Pallikaranai, Chennai - 601 302 as at March 31, 2006 and also the Income and Expenditure Account for the year ended on that date annexed thereto. These financial statements are the responsibility of the management of Centre For Wind Energy Technology (C-WET). Our responsibility is to express an opinion on these financial statements based on our audit.

We conducted our audit in accordance with auditing standards generally accepted in India. Those Standards require that we plan and perform the audit to obtain reasonable assurance about whether the financial statements are free of material misstatements. An audit includes examining, on a test basis, evidence supporting the amounts and disclosures in the financial statements. An audit also includes assessing the accounting principles used and significant estimates made by management as well as evaluating the over all financial statements presentation. We believe that our audit provides reasonable basis for our opinion.

We report that :

We have obtained all the information and explanations, which to the best of our knowledge and belief were necessary for the purpose of our audit.

In our opinion proper books of accounts as required by law have been kept by Centre For Wind Energy Technology (C-WET) so far as it appears from our examination of those books.

The Balance Sheet and Income and Expenditure Account dealt with by this report are in agreement with the books of account.

The Balance Sheet and Income and Expenditure Account dealt with by this report are prepared in accordance with the applicable Accounting Standards issued by the Institute of Chartered Accounts of India.

In our opinion and to the best of our information and according to the explanations given to us, the said accounts together with schedules and notes there-on give the information required under section 10(21) of the Income Tax Act, 1961 in case of Scientific & Research Institution in the manner so required and give a true and fair view in conformity with the accounting principles generally accepted in India.

In the case of the Balance Sheet, of the state of affairs of the Centre For Wind Energy Technology (C-WET) as at March 31, 2006; and

In the case of the Income and Expenditure Account, of the excess of income over expenditure for the year ended on that date.

Date : 11.08.2006

Place : Chennai

for **R. JANAKIRAMAN & COMPANY**

Chartered Accountants

R. JANAKIRAMAN

Partner

(Membership No. 5129)

New # 6, Old # 43, Maharaja Surya Rao Road, Alwarpet, Chennai - 600 018. Phone: 24352596/24352597

E-mail: rjco@md5.vsnl.net.in ; rjco@dataone.net.in Mobile : 93810 51212/98407 56873

**BALANCE SHEET**

BALANCE SHEET AS AT 31ST MARCH 2006

(Amount in Rs.)			
CAPITAL FUND AND LIABILITIES	Schedule	31st March 2006	31st March 2005
CORPUS AND CAPITAL FUND	1	69,302,364	74,739,487
EARMARKED AND ENDOWMENT FUNDS	1A	19,997,690	7,351,976
RESERVES AND SURPLUS	2	50,907,362	23,448,182
UNSPENT BALANCE OF GRANTS IN HAND		56,041,611	44,160,025
SECURED LOANS AND BORROWINGS	-	-	-
UNSECURED LOANS AND BORROWINGS	-	-	-
DEFERRED CREDIT LIABILITIES	-	-	-
CURRENT LIABILITIES AND PROVISIONS	3	29,024,342	22,588,228
TOTAL		225,273,369	172,287,898
ASSETS			
FIXED ASSETS	4	74,062,118	74,096,067
INVESTMENT - FROM EARMARKED AND ENDOWMENT FUNDS	-	-	-
INVESTMENT - OTHERS	-	-	-
CURRENT ASSETS, LOANS AND ADVANCES	5	151,211,251	98,191,831
MISCELLANEOUS EXPENDITURE (to the extent not written off or adjusted)	-	-	0
TOTAL	-	225,273,369	172,287,898
SIGNIFICANT ACCOUNTING POLICIES	13		
NOTES ON ACCOUNTS	14		

For Centre for Wind Energy Technology

As per our Report attached
for R. Janakiraman & Co.,
Chartered Accountants

Sd/-

D. Lakshmanan
General Manager (F&A)

Sd/-

M. P. Ramesh
Executive Director

Sd/-

V. Subramanian
President/ Chairman

Sd/-

R. JANAKIRAMAN
Partner



Centre for Wind Energy Technology, Chennai

INCOME AND EXPENDITURE ACCOUNT

INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED 31ST MARCH 2006

(Amount in Rs.)			
INCOME	Schedule	Current Year	Previous Year
Income from Scientific & Technical Consultancy Services	6	25,661,824	7,586,181
Income from publication	7	341,400	579,910
Interest Earned	8	3,845,177	1,433,751
Other Income	9	342,135	354,182
Grants from Government of India allocated for Revenue expenditure during the year		17,729,907	8,885,805
Deferred Income transferred from Capital Fund (vide note no.4)		13,420,190	11,586,821
TOTAL (A)		61,340,632	30,426,650
EXPENDITURE			
Establishment Expenses	10	8,355,427	7,956,998
Other Administrative Expenses	11	12,052,605	9,169,006
Depreciation	4	13,420,190	11,586,821
TOTAL (B)		33,828,222	28,712,825
Balance being excess of income over Expenditure (A-B)		27,512,410	1,713,825
Prior period adjustment	12	53,230	25,626
BALANCE BEING SURPLUS TRANSFERRED TO GENERAL RESERVE ACCOUNT		27,459,180	1,688,199
SIGNIFICANT ACCOUNTING POLICIES	13		
NOTES ON ACCOUNTS	14		

For Centre for Wind Energy Technology

As per our Report attached
for R. Janakiraman & Co.,
Chartered Accountants

Sd/-

D. Lakshmanan
General Manager (F&A)

Sd/-

M. P. Ramesh
Executive Director

Sd/-

V. Subramanian
President/ Chairman

Sd/-

R. JANAKIRAMAN
Partner



RECEIPTS AND PAYMENTS ACCOUNT

(Amount in Rs.)

	31st March 2006	31st March 2005
I. Opening Balances		
(a) Cash in hand		
(b) Bank balances		
i) In Current Account	11,316,180	14,065,257
ii) In Deposit Accounts	62,680,372	9,093,416
(c) Stamps on hand	700	3,459
II. Grants Received		
(a) From Government of India	40,000,000	60,000,000
(b) From Government of India for execution various projects	21,800,000	9,200,000
(c) From Government of India for organising international training programme	629,423	450,000
III. Income on Investments		
IV. Interest Received		
(a) On Bank deposits	3,845,177	1,433,751
V. Other Income		
(a) Fees for services	16,575,807	7,363,124
(b) Income from publications	341,400	579,910
(c) Energy receipts	6,255,536	
(d) Misc. income	300,108	354,182
VI. Amount borrowed		
VII. Any other receipts		
(a) Fees received in advance on Consultancy projects	5,486,367	10,948,689
(b) Other advance recovered (festival advance)	3,150	12,300
(c) Amt received in excess from DANIDA & repayable		1,310
(d) Security deposit received	210,000	118,006
(e) Earnest money deposit received	925,000	
(f) Service Tax realised	3,326,474	744,156
(g) TDS to be remitted	36,806	
(f) Amount reimbursed by DANIDA towards assets purchased out of previous year's Capital grant		77,990
TOTAL	173,732,500	114,445,550



FOR THE YEAR ENDED 31ST MARCH, 2006

(Amount in Rs.)

PAYMENTS	31st March 2006	31st March 2005
I. Expenses		
(a) Employee related Expenses	7,847,447	7,868,367
(b) Administrative Expenses - (Operational & TA/DA)	10,620,061	8,730,203
II. Payments made against funds for various projects		
Out of CFA		
(a) Execution of R&D project expenses	1,072,297	440,204
(b) Research support to WRA	403,416	161,816
(c) HRD and manpower training	330,804	84,805
(d) Seminar & Information dissemination	188,480	198,099
(e) Accreditation fee	51,709	82,610
(f) Advance for execution of projects	98,350	49,000
Out of Grants for projects		
(a) International training programme	804,216	355,123
(b) Parameterisation of WT	600,000	
(c) Scanning of wind profile in Palghat gap	3,043,867	
(d) Wind Shear Assessment expenses	1,546,172	
(g) Wind Energy Resource Survey Project		506,965
(h) North-Eastern Project	918,406	261,574
(i) Micro-survey & preparation of Master Plan		
(j) Study on Uncovered / New areas (2003-04 & 2004-05)	3,721,715	2,959,526
III. Investment and Deposits made		
IV. Expenditure on Fixed assets & Capital Work-in-Progress		
(a) Purchase of Fixed assets	13,100,831	10,126,830
(b) Expenditure on Capital Work-in-progress -Campus & furniture	-3,950,853	
(c) Advance on capital account (including imports)	-7,535,058	5,314,335
V. Refund of Surplus Money		
(a) Balance of Grants-in-aid to Government of India		94,877
VI. Other Payments		
(a) Refund of Security deposits	30,000	45,000
(b) Refund of Earnest Money Deposits	470,000	
(C) Expenditure on Consultancy Projects	1,247,732	306,566
(d) Advance on Consultancy projects	-2,177,704	1,670,836
(e) Advance & Deposits	-525,796	350,946
(f) Due from DANIDA		11,989
(g) Prior period expenses	53,230	25,626
(h) Service tax remittances	3,326,943	797,001
(i) Festival advance paid		6,000
VII. Closing Balances		
(a) Cash in hand		
(b) Bank Balances		
i) In Current Account	11,640,254	11,316,180
ii) In Deposit Accounts	126,805,982	62,680,372
(c) Stamps on hand		700
TOTAL	173,732,500	114,445,550

For Centre for Wind Energy Technology

As per our Report attached
for R. Janakiraman & Co.,
Chartered Accountants

Sd/-

D. Lakshmanan
General Manager (F&A)

Sd/-

M. P. Ramesh
Executive Director

Sd/-

V. Subramanian
President/ Chairman

Sd/-

R. JANAKIRAMAN
Partner



Centre for Wind Energy Technology, Chennai

AUDITORS:

R. JANAKIRAMAN & CO.,
Chartered Accountants,
New no.6, Old no.43, Maharaja Surya Rao Road,
Alwarpet,
Chennai - 600 018

BANKERS:

Canara Bank
NIOT Extension counter,
Pallikaranai
Chennai - 601 302

State Bank of India
Adyar
Chennai - 600 020

REGISTERED OFFICE

Centre for Wind Energy Technology
Survey No. 657/1A2
Velachery – Tambaram High Road
Pallikaranai
Chennai – 601 302



पवन ऊर्जा प्रौद्योगिकी केन्द्र
(अपारंपरिक ऊर्जा स्रोत मंत्रालय, भारत सरकार के अधीन
स्वायत्त अनुसंधान एवं विकास संस्था)

CENTRE FOR WIND ENERGY TECHNOLOGY

(An Autonomous R&D Institution under the Ministry of Non-Conventional
Energy Sources, Government of India)

वेलाचेरी - ताम्बरम मेन रोड, पल्लीकरणई, चेन्नई - 601 302, तमिल नाडु, भारत.

Velachery - Tambaram Main Road, Pallikaranai, Chennai - 601 302, Tamil Nadu, INDIA.

दूरभाष / Tel. No. +91-44-2246 3982 / 83 / 84 फेक्स / Fax No.: + 91-44-2246 3980

ई-मेल/E-mail : info@cwet.res.in & cwet.@md4.vsnl.net.in वेबसाइट /website: www.cwet.tn.nic.in