

वार्षिक प्रतिवेदन ANNUAL REPORT 2006 - 2007



C-WET

पवन ऊर्जा प्रौद्योगिकी केन्द्र

CENTRE FOR WIND ENERGY TECHNOLOGY

(नवीन एवं नवीकरणीय ऊर्जा मंत्रालय के अंतर्गत स्वायत्त अनुसंधान एवं विकास संस्थान)

(एमएनआरई), भारत सरकार

(An Autonomous R & D Institution under the Ministry of
New and Renewable Energy, Government of India)

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CENTRE FOR WIND ENERGY TECHNOLOGY

(An Autonomous R & D Institution under the Ministry of New and Renewable Energy [MNRE], Government of India)

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

2006-07 was an eventful year with wind turbine industry continuing its rapid progress and gaining acceptance even among conservative financing establishments. C-WET, on its part has been providing value added services to all stake holders. Presently C-WET is the preferred consultant for wind farm planning for some of the most prestigious establishments. Internally, there has been much emphasis on bringing up the expertise and competencies to international level. Preparation of Indian Wind Atlas has been started. Indian standards for wind turbine evaluation are under preparation. Electro-technical Committee of Bureau of Indian Standards has now set up an Electro-technical Committee (ET-42) under the Chairmanship of Executive Director, Centre for Wind Energy Technology to be the focal point of the standardization of wind turbine evaluation and to co-ordinate with International Electro-technical Committee (IEC) in respect of wind turbines. Accordingly, the work related to the Technical Committee 88 (TC - 88) is being addressed by C-WET regularly. India being a primary member of TC - 88 is required to comment, suggest modifications and vote on draft standards to be adopted. The recommendations for these activities are given by the Chairman of ET-42. C-WET has applied for MEASNET membership and evaluation has been initiated. During the year a number of training programmes were organized and scientists from C-WET are invited by various

academic and other institutions in their training programmes and other events.

Research & Development

The unit is involved in setting up Wind-Solar-Pungam oil engine - generator system in the campus. The system integration is being carried out. The 14.4 kW SPV array is divided into two parts. The first array is doubling as a two wheeler stand. Second array is installed on the technology block. The system integration is being carried out in consultation with Indian Institute of Technology, Chennai. In order to get a good understanding about the wind flow around the nacelle of a wind turbine, a scaled model was installed in the SERC's boundary layer tunnel and detailed measurements were carried out to determine locations which would be least affected by the nacelle body. This will help in minimizing the errors due to the placement of anemometer on the wind turbine for site calibration. Site calibration is resorted to when the measurement site does not conform to IEC 61400-12-1 stipulations. Sound Detection And Ranging (SODAR) instrument was deployed in the Palghat gap and readings were taken over two to three days at fifteen locations. Steep rise in wind speed in the first two hundred meters at most locations is clearly seen indicating that the power law index in the region is rather high and could be used with good advantage.



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Scooter Stand with SPV roof

Wind – SPV – Pungam oil engine System

Aero generator

Capacity	: 2 x 5 kW (10 kW)
Cut-in wind speed	: 3 m/sec
Rated wind speed	: 13.9 m/sec
Furling wind speed	: 15.4 m/sec
Rotor Diameter	: 5 m
Hub heights	: 20/25 m

Solar Photo Voltaic system

Capacity	: 14.4 kW Peak
Type	: Single Crystal
System voltage	: 288 V

Pungam Oil Engine

Engine	: Straight Vegetable Oil(SVO)
Engine capacity	: 20kW / 25 kVA
Make	: Greaves Cotton Ltd.
Oil consumption/kwh	: 0.5 lit/kwh

Wind Resource Assessment

The unit has begun the preparation of wind atlas for India in collaboration with Riso National Laboratory, Denmark.

Three scientists were trained on meso-scale modeling at Riso and required infrastructure has been procured. Initial discussions have been held with GIS professionals for data presentation and development of query shells. The wind monitoring programmes in uncovered areas has been making progress in the states in twenty eight states at forty five locations. In addition, C-WET is also helping private sector and State Nodal Agencies to carry out their own monitoring. During the year twelve such projects were completed and six are on going. The unit is handling some of the most prestigious wind farm planning and performance evaluation projects for public sector and large private sector undertakings and individuals. Some of the projects (50 MW) are sponsored by Tata Power Company, 96 MW for MSPL, which is the largest single entity in the country.

Wind Turbine Testing

2006-07 was a very important year for wind turbine testing by C-WET. The measurements pertaining to mechanical and electrical signals from the wind turbines were accredited as per ISO/IEC 17025:2005 requirements. The implication is that the measurement reports produced by WTTS would be acceptable in over forty five countries around the world. Most of the countries are active in wind. The type tests on Suzlon's 600 kW wind turbine have been concluded at Kayathar. Type tests on IWPL's 250 kW wind turbine has been initiated in Gujarat. Preparation for three tests have been started in Gujarat for Enercon's 800 kW, Suzlon's 1500 kW and 350 kW respectively.



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Standards & Certification

With the need to align standards work regarding wind turbine type certification effectively with International Electrotechnical Committee, the BIS formulated a sub committee under Electro-Technical division. This division interacts with IEC all matters relating to international standards development. Being a participating member, India has voting rights on the standards and technical papers before adoption. BIS communicates the decisions of Chairman, ET-42 to IEC as Indian position.

The Revised List of Models and Manufacturers is an important document referred to by all stakeholders and permitting authorities before any given model is chosen to be used in a wind farming project. Two such lists were issued during the year 2006-07. The committee appointed by MNRE has stakeholders from both manufacturers and wind turbine owners / users and decisions are based on the terms of reference given by MNRE. Three type certificates were renewed and eleven certification assignments are being carried out.

Information, Training and Commercial Services

A fifteen minutes documentary film on C-WET highlighting the services offered and aims and policies of Government with regard to wind power was made.

The news letter published on a quarterly basis is now much in demand. This year the web page was made bi-lingual and is a much referenced web page. On an average sixty to seventy hits are recorded per day.



Hindi home page of C-WET website

A National Training Programme was organized in Pune and attended by forty two persons from various establishments.



4th National training is in progress at Pune



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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, Tamilnadu, with technical and financial support from DANIDA, a Government of Denmark agency.

Mission

C-WET, a 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 will support the wind turbine industry in achieving and sustaining quality such that products of the highest quality and reliability are installed, 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 coordinate 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



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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.





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FROM THE UNITS



RESEARCH AND DEVELOPMENT

Establishment of R & D wind farm is underway. Flow distortion measurements around the nacelle have now been completed at Structural Engineering Research Centre's wind tunnel. The experiments using SODAR in Palghat gap have yielded interesting results. The project sponsored to National Aerospace Laboratories regarding development of design methodologies is making progress. With small wind turbine testing becoming important the unit has geared up to undertake assignments in this regard in association with the wind turbine testing unit. As part of 'proof of concept' C-WET has established a Wind-Solar-SVO based power supply system and is carrying out experiments.

R & D Wind farm

R & D unit is presently working on setting up wind turbines to help in detailed experiments. It is proposed to set up two wind turbines ranging from 500 kW to 1000 kW (Pitch/Stall) at Wind Turbine Test Station, Kayathar, to be used as an experimental facility. Some of the focus areas for research on the wind farm will be

- ✦ Study on effect of grid outages on wind turbine components.
- ✦ Study of wake losses.
- ✦ Joint and simultaneous measurements with various measuring laboratories like DEWI, RISO etc.
- ✦ Modeling / simulation studies on wind turbines and subsequent validation.

- ✦ Measurements leading to formulation of International Standards.

Procurement of pitch regulated wind turbine is under finalization.?

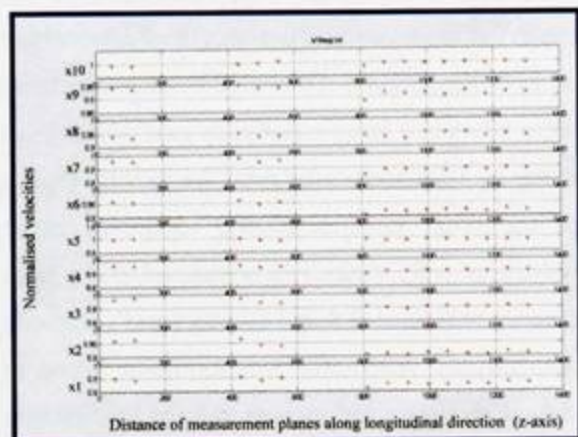
Parametrisation of flow distortion round wind turbine nacelle

C-WET, in association with SERC, Chennai has carried out wind tunnel experiments to map the mean velocities around the nacelle of a prototype wind turbine model. The velocity measurements were taken at a large number of grid points in as many as 16 planes fixed near the nacelle region of the wind turbine model. Upstream mean velocities were measured at various grid points corresponding to 6, 8 and 10 m/s wind velocities respectively. A suitable measurement frame as shown in figure below was moved to different planes for successive measurements.



Measurement frame near nacelle

A multi-channel, high scan pressure measurement system with a sampling rate of 400 Hz per channel was used for the measurements and the mean velocity at any given point was deduced from the dynamic pressure (P) value. The mean velocities were found after normalizing the measurements corresponding to the three velocities.



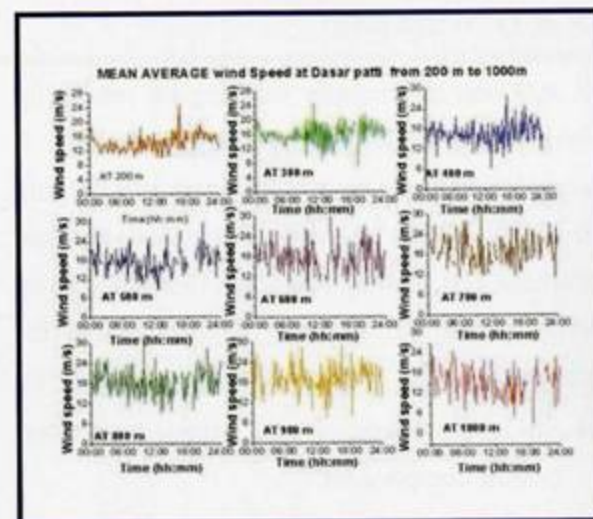
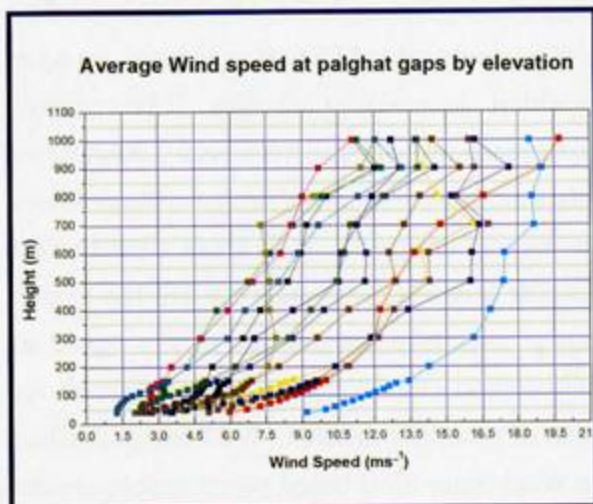
Normalised mean velocities at grid points of a plane

The above figure shows the normalized distribution of mean velocities at different grid points corresponding to a plane. The results will help in locating the anemometer at points with minimum perturbations.

Wind profiles in Palghat

Measurements were carried out using the SODAR at the Palghat gap. For the purpose, 15 grid lines were identified along the gap region with each line containing 3 to 5 grid points. Three dimensional wind profiles

were measured up to a height of 1000 m. The data analysis and report preparation is in progress.



A joint programme with ADRDE, Agra is also proposed to measure wind data at heights of 80-100 m and subsequent validation of SODAR data.



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 aim 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.

Analytical design methodologies were developed and validated using the experimental data from an available 300 kW, 2-bladed, downwind, stall-regulated, horizontal-axis wind turbine. Based on these validations design of a similar 500 kW turbine was completed. Experimental data will be gathered from the demonstrator wind turbine (500 kW) to validate the methodologies evolved.

Aerodynamic performance studies will be carried out on augmentation devices like Gurney Flaps, which will be employed in actual field trials also.

Testing of small wind turbines

A Test facility has been setup to undertake testing of small wind turbines with swept area less than 200m² at Kayathar. The proposed testing is as follows:

1. Safety and function test
2. Duration test
3. Power performance test

Necessary instruments for conducting the type tests have been procured.

M/s. Supernova Technologies Pvt. Ltd. has approached C-WET with a request to test its model SNT 50 (5 kW) during the windy season of 2007.

Wind-Solar Hybrid System at C-WET campus

R &D Unit is setting up a 25 kW Wind-Solar Hybrid System at C-WET premises to meet the load demand partially and also to undertake R&D studies on the system. The integrated system shall consist of:

- (i) 10 kW (2 x 5 kW) Small Wind Turbine Generating System
- (ii) 15 kW Solar Photovoltaic (SPV) System

Wind and solar energy can complement each other and will supply the lighting and UPS loads in the campus. The Power Conditioning Unit will operate in bidirectional mode, with provision for Grid Charging and Grid Export.

The installation and commissioning of the Solar Photovoltaic system is in progress.



Power Conditioning Unit



5 kW Wind Battery Charger installed in C-WET Campus



Solar street lights installed in C-WET campus



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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. The Ministry of New and Renewable Energy (MNRE), Government of India have been sponsoring programmes

to measure, analyze and publish wind data in our country for the last two decades. Wind have been measured at five hundred forty one locations for periods ranging from one to five years since 1986. As on March 31st 2007 forty five stations are in operation in 14 states. During 2006-07 a total number of 16 wind monitoring stations were installed. The over all status of the wind monitoring stations in the country is given in below table.

Status of Wind Monitoring Stations (2006-07)

S.No.	State	Number of Stations				
		Established till 31.3.2007	Continued from 2005-06	Closed during 2006-07	Installed (new) during 2006-2007	In operation as on 31.03.07
1	ANDAMAN & NICOBAR ISLANDS	14	4	-	-	4
2	ANDHRA PRADESH	62	1	-	2	3
3	ARUNACHAL PRADESH	9	5	-	-	5
4	ASSAM	7	2	-	-	2
5	CHATTISGARH	3	2	2	-	-
6	GOA	1	1	1	-	-
7	GUJARAT	58	-	-	2	2
8	HARYANA	6	1	1	-	-
9	HIMACHAL PRADESH	9	-	-	-	-
10	JAMMU & KASHMIR	7	-	-	-	-
11	JHARKHAND	2	2	2	-	-
12	KARNATAKA	42	4	2	5	7



S.No.	State	Number of Stations				
		Established till 31.3.2007	Continued from 2005-06	Closed during 2006-07	Installed (new) during 2006-2007	In operation as on 31.03.07
13	KERALA	25	2	2	-	-
14	LAKSHADWEEP	10	-	-	-	-
15	MADHYA PRADESH	32	3	2	2	3
16	MAHARASHTRA	89	11	11	2	2
17	MANIPUR	5	5	-	-	5
18	MIZORAM	5	5	-	-	5
19	ORISSA	10	-	-	-	-
20	PONDICHERRY	4	-	-	-	-
21	PUNJAB	11	-	-	-	-
22	RAJASTHAN	37	2	1	-	1
23	TAMIL NADU	62	2	2	1	1
24	TRIPURA	3	3	3	-	-
25	UTTARAACHHAND	11	-	-	-	-
26	UTTAR PRADESH	4	-	-	2	2
27	WEST BENGAL	10	1	1	-	-
28	SIKKIM	3	3	-	-	3
	Total	541	59	30	16	45

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 541 stations established till 31.03.2007, 211 stations have been found to have Wind Power Density (WPD) in excess of 200 W/m^2 at 50 m agl. Summary of these 211 stations are given in the following table.

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

WPD Distribution at the 211 stations



WRA IN THE UNCOVERED REGION

State wise details of the wind monitoring stations commissioned during 2006 - 2007 in the country under various programmes are

given in the table below. All the masts are of 50 m height. Sensors are placed at 50 m, 30 m and 10 m levels.

State wise installations of wind monitoring stations established during 2006-07

Sl. No.	Stations Established	State	District	Commissioned On
1	Pudupudur	TAMIL NADU	Dindigul	21.11.06
2	Ganganmal	MAHARASHTRA	Yavatmal	03.08.06
3	Police Wadi		Nanded	01.08.06
4	Banbirkheri	MADHYA PRADESH	Guna	20.07.06
5	Barodiya		Mandsaur	23.07.06
6	Indraj	UTTAR PRADESH	Rae-Bareilly	16.07.06
7	Nagla Kail		Farrukhabad	18.07.06
8	Sanghi Nagar	ANDRA PRADESH	Rengareddy	07.08.06
9	Patcharlakonda		Vishakapattinam	09.08.06
10	Sangsar	GUJARAT	Dahod	12.03.07
11	Vadgam		Anand	26.07.06
12	Gokarna	KARNATAKA	Karwar	14.11.06
13	Huvilamadi		Karwar	16.11.06
14	Midakkanahalli		Belgaum	21.04.06
15	T.B.Dam		Bellary	11.06.06
16	T.B.Dam II		Bellary	02.11.06

SNAs & OTHER INSTITUTIONS

Data collection over from the previous year at five wind-monitoring stations commissioned in the Latur and Sangli districts of Maharashtra under a programme with MEDA, Pune. The report is prepared.

Data collection over from the previous year at three wind-monitoring stations commissioned in the Konkan region of Maharashtra under

a programme with MEDA, Pune. The report is prepared.

Data Collection is on at Midakanahalli, Gokak, Karnataka for M/s. Hutti Gold Mines Company.

Data Collection is on at T.B.Dam, Hospet for M/s. MSPL Limited.

Data collection is on at T.B.Dam II, Hospet for M/s. MSPL Limited.



CONSULTANCY PROJECTS

In addition to the wind monitoring projects, the unit has carried out 23 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 below table.

Consultancy projects taken up during 2006-2007

SLNo.	Name of the Project	Name of the Client	Remarks
1	Micrositing and Estimated Annual Generation of WTGs for Wind Farm at Bhimasamudra, Chitradurga Dist, Karnataka	M/s.Nuziveedu Seeds Ltd., M/s.Evergreen Energies Ltd, Secunderabad	Ongoing
2	Micro siting for Wind Farm at Brahmanvel Area, Dhule Dist. Maharashtra	M/s.Suzlon Energy Ltd, Pune	Completed
3	Micro siting and Estimated Annual Generation of WTGs for wind farm at Tattapparai and Marandai at Alangulam Taluk of Tirunelveli Dist. Tamilnadu.	M/s.Teledata Informatics Ltd, Chennai	Completed
4	Micrositing for wind farm at Vagaikulam, Tirunelveli Dist.,	M/s.Shriram EPC Ltd., Chennai	Ongoing
5	Wind Monitoring at Hospet, Bellary (TB Dam II)	M/s.MSPL Limited, Hospet	Ongoing
6	Wind Monitoring in the Nilgiris	TEDA, Chennai	Ongoing
7	Wind Resource Assessment study at a location near Nasik	M/s.D.J.Malpani, Nashik	Ongoing
8	Verification of Procedure of Wind Monitoring at Suthari, Bhuj District, Rajasthan	M/s.Suzlon Energy Ltd, Pune	Completed
9	Verification of Procedure of Wind Monitoring at Khori Forest Maharashtra	M/s.Suzlon Energy Ltd, Pune	Completed
10	Verification of Procedure of Wind Monitoring at Guddadabommanahalli, Hassan District	M/s.Suzlon Energy Ltd, Pune	Completed



Sl.No.	Name of the Project	Name of the Client	Remarks
11	Verification of Procedure of Wind Monitoring at Pangan,Dhule district,Maharashtra	M/s.Suzlon Energy Ltd,Pune	Completed
12	Verification of Procedure of Wind Monitoring at Palsori, Ratlam District,M.P	M/s.Suzlon Energy Ltd,Pune	Completed
13	Verification of Procedure of Wind Monitoring at Kharda Mewasa Jodhpur	M/s.Suzlon Energy Ltd,Pune	Completed
14	Verification of procedure of wind monitoring at three locations in Rajasthan,Madhya Pradesh & Gujarat	M/s.Enercon India (p) Ltd,Mumbai	Completed
15	Production estimate for Suzlon S-52/600 KW WTG at Midapadi Village,Palani Taluk,Dindigul,Tamilnadu	M/s.Uniply Industries Limited, Chennai	Ongoing
16	Site Validation and Individual Machine Generation Estimation in Maharashtra	M/s.Tata Power Company Limited, Raigad	Completed
17	Consultancy Charges for Wind Farming Projects in Tamilnadu	M/s.CPCL,Chennai	Completed?
18	Performance evaluation study of M/s.MSPL wind farms in Karnataka	M/s.MSPL limited,Hospet	Ongoing
19	Due-Delligence report 31.2 MW wind farm at Hanumanahatti,Belgaum,karnataka	M/s.Enercon India (p) Ltd,Mumbai	Ongoing
20	Estimation of Generation for various Turbines at Jogimatti	M/s.MSPL limited,Hospet	Ongoing
21	Production estimate for 2.25MW wind Farm Project at Pratabgarh	M/s.Vestas Wind Technology India (p) Ltd,Chennai	Completed
22	Project Proposal for Data Validation of Proposed Wind Farm Project at Brahmanvel	M/s.Tata Power Company Limited, Raigad	Ongoing
23	Implementation of a promotional and Demonstration Wind Farm of Capacity 3.5MW-5MW at Ramakkalmedu,Idukki	KSEB,Thiruvananthapuram	Completed





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R & D PROJECTS (WRA)

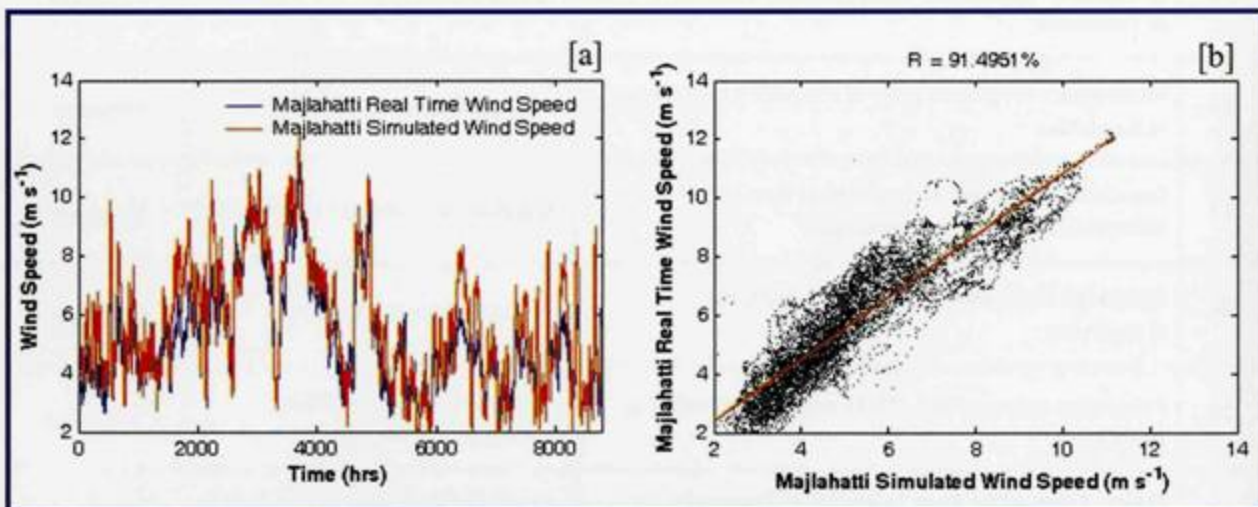
Power Law Index Verification Programme

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 ($\sim 50\text{--}70\text{ m}$) 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 50 m 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. The station at Kalunirkulam was closed down during this period. The report is being prepared. Action initiated to commission a station at Malpada, Dhule District, Maharashtra.

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.



First panel shows the time series of wind speed measured at 30 m height of Majlahatti (blue line) and simulated wind speed (red line). The simulation is carried out in consideration of three month data of Majlahatti and one year data of Chikoddi. Second panel shows the correlation between real time and simulated data.



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. As a location identified at Nagda in Madhya Pradesh is not available an alternate site Kadavakallu in Andhra Pradesh has been identified and action has been initiated to commission the station. The experiment has the aim of validating the procedures and techniques. A report prepared based on the data collected at Majlatti has been prepared during the period.

Preparation of Indian Wind Atlas

Ministry of New and Renewable Energy (MNRE) has sanctioned a project on “Preparation of Wind Atlas In India” in association with Riso National Laboratory, Denmark. The project duration is two years. Nine Scientists / Engineers from C-WET have been trained with Wind Atlas Analysis Software Programme (WASP) by experts from Riso National Laboratory, Denmark for analyzing and interpretation of data as part of the project.



50 m tall instrumented mast under installation at T. B. Dam, Karnataka



WIND TURBINE TESTING

Development of Wind Turbine Test Station

C-WET has been operating the Wind Turbine Test Station (WTTS) near Kayathar, in Tamil Nadu. This Test Station has the following facilities.

- ✦ Availability of two test beds to test wind turbines up to 1250 kW capacity and 400 kW 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.
- ✦ Availability of an office cum workshop building at WTTS with facilities of carrying out functionality checks of instruments and various sensors. The workshop is equipped



Engineer carrying out measurements

with adequate space to accommodate a nacelle for instrumentation purpose. 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 Enercon 800 kW at Bamnasa, Jamnagar District, Gujarat of M/s. Enercon India Ltd, Mumbai was started during June 2005. After completion of the measurements in December 2005, analysis were carried out and reports were delivered to the customer.

During the wind season of the year 2006, the testing unit of C-WET started the PTT on Suzlon 600 kW wind turbine of M/s. Suzlon Energy Ltd, Pune. The measurements have been completed. Preparation of draft reports are in progress.

The measurements for the PTT of IWPL 250 kW wind turbine for M/s. IWPL Ahmedabad and Suzlon 1500 kW wind turbine for M/s. Suzlon Energy Ltd have been started in the first quarter of 2007.

The preparatory works for instrumentation for the PTT of E53 / 800 kW wind turbine for M/s. Enercon India Ltd at Gujarat and Siva 250 kW wind turbine for M/s. Siva Wind Turbine India Private Ltd at WTTS Kayathar are underway.



Testing team discussing with the client at Moti Sindhodi

An agreement had been entered into for the PTT of Suzlon 350 kW wind turbine of M/s. Suzlon Energy Ltd. The measurements are expected to start in June 2007.

Quality Management System and Accreditation as a Measurement Laboratory

As part of Quality Management System, testing unit is certified as per the requirements of ISO 9001:2000 standard valid till August 2007. The unit is also accredited as per the requirements of ISO/IEC 17025:2005 by National Accreditation Board of Testing and Calibration Laboratories (NABL), New Delhi which is valid till June 2008. NABL has a 'Mutual Recognition Arrangement' (MRA) with Asia Pacific Laboratory Accreditation Cooperation (APLAC) which in turn has a MRA with International Laboratory Accreditation Cooperation (ILAC). Under this, the measurements reported by the unit would be accepted by fourty five member countries.

The unit has applied for International Network for Harmonised and Recognised Measurements in Wind Energy (MEASNET) membership which is an International Network of measuring

laboratories for wind turbines in the area of Power Performance Measurements. The unit is awaiting information from MEASNET regarding the technical audit.

Other Facilities

The unit has a well equipped laboratory at C-WET, Chennai where functional testing of data acquisition systems along with sensors and transducers is done before deployment.



Engineers inspecting the extenders for strain gaging

A partial wind turbine simulator has been designed which can be instrumented for training of engineers in deployment of instrumentation. This helps in gaining hands on experience in strain gauging, installation of data acquisition units, line calibration etc.



Engineer Strain gaging in turbine tower

**C.W.E.T.**

Centre for Wind Energy Technology, Chennai

Test and Measurement Completed and Ongoing

YEAR	TEST	WIND TURBINE
1999	In-situ Power Performance (near Muppandal)	500 kW 39 m rotor diameter of VESTAS make
1999	In-situ Power Performance (near Coimbatore)	250 kW 29.7 m rotor diameter of BHEL make
2000	Provisional Type Test at WTTS	500 kW, 47 m rotor diameter of VESTAS make
2000	Provisional Type Test at WTTS	350 kW, 33.4 m rotor diameter of SUZLON make
2001	Provisional Type Test at WTTS	1000 kW, 60 m rotor diameter of SUZLON make
2001	Provisional Type Test at WTTS	225 kW, 29.6 m rotor diameter of NEPC make
2002	In-situ Power Performance (near Muppandal)	750kW, 48 m rotor diameter of NEG-Micon make
2003	Provisional Type Test at WTTS	1250 kW, 64 m rotor diameter of SUZLON make
2003	Provisional Type Test at WTTS	250 kW, 29.6 m rotor diameter of TTG make
2003	In-situ Power Performance (near Jaisalmer, Rajasthan)	1000 kW, 62 m rotor diameter of SUZLON make
2003	In-situ Power Performance Enercon, Kappathgudda, Karnataka	230 kW 30 m rotor diameter of Enercon make
2004	Provisional Type Test at Govindhapuram	600 kW, 48 m rotor diameter of Enercon make
2004	Provisional Type Test at Senghuvadi	600 kW, 48 m rotor diameter of Vestas RRB make



YEAR	TEST	WIND TURBINE
2004	Provisional Type Test at Bamnasa, Gujarat	800 kW, 48 m rotor diameter of Enercon make
2005	In-situ Power Performance, Chitradurga, Karnataka	950 kW, 54.5 m rotor diameter of NEG -MICON
2005	Provisional Type Test at Kayathar	600 kW, 52 m rotor diameter of Suzlon make
2006	Provisional Type Test at Bhogat, Gujarat	250 kW, 29 m rotor diameter of IWPL make
2006	Provisional Type Test at Moti Sindhodi, Gujarat	1500 kW, 29 m rotor diameter of Suzlon make
2006	Provisional Type Test at Kayathar	250 kW, 30 m rotor diameter of Siva make
2007	Provisional Type Test at Gujarat	800 kW, 53 m rotor diameter of Enercon make
2007	Provisional Type Test at Gujarat	350 kW, 30 m rotor diameter of Suzlon make



C-WET

Centre for Wind Energy Technology, Chennai

STANDARDS & CERTIFICATION

The wind industry in India has witnessed the accelerated growth over the past few years. Globally, India is considered to be having a promising and potential market on wind power. In order to sustain the growth of Indian wind industry, adequate level of safety and quality of the wind turbines need to be ensured. Hence, Type Certification for wind turbines plays an active and important role for the orderly growth of the Indian wind industry, especially with the growing unit size of a wind turbine.



Signing of agreement with M/s. Enercon India Limited for Provisional Type Certification of E53 – 800 kW wind turbine model

The Indian Type Certification Scheme for wind turbines, viz., Type Approval – Provisional Scheme (TAPS-2000) (amended) has been formulated in line with International Standards (IEC), while taking into account of the Indian conditions.

TAPS – 2000 (amended) has been approved & issued by Ministry of New and Renewable Energy (MNRE). Standards and Certification unit is implementing TAPS-2000 (amended) for type certification of wind turbines in India.



Manufacturing system inspection as part of Provisional Type Certification

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

QMS ISO 9001: 2000

Certification services of C-WET have already been certified for ISO 9001:2000 by DNV. The second surveillance audit has been successfully carried out by DNV and recommended for continuation of the certificate.



Centre for Wind Energy Technology, Chennai

Provisional Type Certification

A. Provisional Type Certificates –Renewed (2006 – 2007)

Sl.No.	Manufacturer's Name	WT Model / Capacity	Validity
1	Vestas RRB India Limited	V39-500 kW with 47 m rotor diameter – 500 kW	20.04.2007
2	NEG MICON Limited	NM 48/750 – 750 kW	25.08.2007
3	Southern Wind Farms Limited	GWL 225 - 225 kW	27.02.2008

B. On-going Projects

Provisional Type Certification - Category I Projects as on 31.03.2007

Sl.No.	Manufacturer's Name	WT Model / Capacity	Status
1	Elecon Engineering Company Ltd	T600-48 - 600 kW	On going
2	Vestas RRB India Limited	Vestas V27 – 225 kW	On going

Provisional Type Certification - Category II Projects as on 31.03.2007

Sl.No.	Manufacturer's Name	WT Model / Capacity	Status
1	Vestas RRB India Limited	Pawan Shakthi-600kW	On going
2	Enercon (India) Limited	Enercon E48/800kW	On going
3	Suzlon Energy Limited	Suzlon S70/1250 kW	On going
4	Enercon (India) Limited	Enercon E53 / 800kW	On going
5	Suzlon Energy Limited	N 3335 – 350 kW with 60 and 70 m lattice tower	On going

Provisional Type Certification - Category III Projects as on 31.03.2007

Sl.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 WindPower Limited	I-29/250 / 250 kW	On going
4	Suzlon Energy Limited	Suzlon S82 – 1500 kW	On going



Indian Standards on Wind Turbines

S&C unit is actively involved in preparation of the Indian Standards on Wind Turbines. Executive Director, C-WET has been nominated as a convener of the working group - Wind Energy, under Non-conventional Energy Sources Committee: ME 04 by Bureau of Indian Standards (BIS). Unit Chief (i/c), S&C has been nominated as a member in the working group. Three draft standards, prepared by C-WET have been circulated to the working group members. S&C unit has organized the first meeting of the working group on 05-04-2006 at C-WET, Chennai to discuss on the draft Indian standards. Subsequently, BIS has constituted a Wind Turbine Sectional Committee (ET42) under Electrotechnical Division of Bureau of Indian Standards. Executive Director, C-WET has been nominated as the Chairman of ET42. Unit Chiefs of S&C and Testing departments have been nominated as members. In the first meeting of ET42, held at BIS, New Delhi on 28.11.06, method of preparation of Indian standards and methodology for adoption of IEC standards have been discussed. The draft Indian Standards, prepared by C-WET, have been presented.

Executive Director, CWET and Unit Chief, S&C attended the Technical Committee (TC - 88) meeting held in Charlottenlund, Denmark.

Executive Director put forth Indian points of view on several matters of importance.

Revised List of Models and Manufacturers of Wind Electric Generators / Wind Turbine Equipment (RLMM)

RLMM committee has been reconstituted by MNRE. Executive Director, C-WET has been nominated as the chairman along with three other members and Unit Chief (S&C), C-WET as secretary to enlist the models and manufacturers of wind electric generators / wind turbine equipment. The RLMM committee meetings have been held to verify the documentation provided by the manufacturers and to finalize the list. Two RLMM lists have been issued by C-WET.

Development of Software for issuing Concessional Customs Duty Certificate

S&C unit is coordinating with M/s. National Informatics Centre, Chennai for the development of Prototype software to help in preparing Concessional Customs Duty Certificate (CCDC) for MNRE. Inputs received from concerned organizations have been consolidated and the implementation is in progress.

INFORMATION, TRAINING AND COMMERCIAL SERVICES

The Information, Training and Commercial Services (ITCS) unit executed the following activities during the year 2006–2007.

National Training

Fourth National Training: The Fourth National Training Programme on “WIND FARM DEVELOPMENT AND RELATED ISSUES” was organised successfully on 9th and 10th November 2006 to address all aspects of Wind Power starting from Wind Resource Assessment to project implementation and operations in a focused manner.



Dr. G. B. Pant inaugurating the training course

Newsletter

C-WET has continuously bringing out its well received quarterly newsletter “PAVAN” to create awareness and disseminate information on wind energy developments as well as the role & activities of the Centre.

“PAVAN” highlights the happenings / accomplishments / endeavors of C-WET and carries focused articles, success stories, expert’s

interviews, new rules and policies of Government, and the latest news & views.

In this succession, twelve issues of PAVAN has already been published and circulated.

C-WET Video Film

C-WET is the only institute of its kind in the developing countries and a technical focal point to accelerate wind energy development in our country. The awareness creation and information dissemination of the activities & role of the center as well as local & global developments in the wind energy sector are essential need of the day. Now, C-WET completed its fifth year of sustainability and achieved many fruitful results for the development of wind energy sector in the country. The time has come to propagate its activities and achievements to the public.

A fifteen minutes self-explanatory / corporate video film on C-WET in Hindi & English has been prepared to highlights the achievements / activities & services of C-WET. Shri. Vilas Muttemwar, Honorable Minister of State, MNRE released the video film in the inaugural session of the Green Power 2006 on 13th July 2006 at Chennai Trade Centre, Chennai.

Being a new field such tools for disseminating information will go a long way in informing general public and experts about the capabilities and knowledge available in the country.



System development of Wind Turbine Registration and performance of data collection

An appropriate system should be developed for collection of data of wind turbine machines and performance, which will help us to have useful database. As a step towards implementation, we had organized internal meetings and also a meeting with State Nodal Agencies. As a result a web based software and database system has been developed for this purpose and we are in the process of implementing.

Bilingual Website

The existing website is being updated regularly with the new information.

Library

C-WET Library is being strengthened by adding Indian & Foreign books and periodicals allied to Wind Energy in particular and renewable energy in general.

Hindi Day Celebrations

"Hindi Diwas" was celebrated on 23rd September 2006 at the Conference Hall of Centre For Wind Energy Technology. Shri M. P. Ramesh, Executive Director and Chairman of Hindi Promotion Committee, C-WET extended 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 competition was conducted for the employees of C-WET.

Chief Guest, Shri. J. L. Sharma, Senior Hindi Officer, CLRI, Chennai delivered keynote address and explained the importance of promotion of Hindi, 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 following employees were deputed for Probodh Hindi Classes during 2006 and passed examination:

1. Shri M. Anvar Ali, Scientist 'C'
2. Shri M.R. Gunasekaran, Steno
3. Smt. K. Tamilselvi, Assistant
4. Shri P. Kanagavel, Scientist 'B'
5. Shri K. Boopathi, Scientist 'B'
6. Shri R. Girirajan, Assistant
7. Smt. T. Arivukkodi, JE

The above employees were sanctioned Cash Awards as per rules for passing hindi examination.

Cyprus Delegation Visit

Five member delegation from Cyprus visited C-WET and the Executive Director, C-WET made a presentation about the activities of C-WET and also about wind energy. The delegation were taken to the Vestas RRB Manufacturing unit.

Visit to Abroad

M.P.Ramesh, Executive Director visited Denmark and UK from 28th June to 2nd July 2006 – Official - cum - Business delegation led by Hon'ble Minister of New and Renewable Energy.



Publications

Wind Resource Assessment

1. Prospects of wind energy in India: Dr. E Sreevalsan, Co-Author of the paper published in International Journal of Global Energy Issues (IJGEI), Vol. 26, No. 3/4, 2006.

2. Wind Farm Site Assessment Using Measure - Correlate - Predict (MCP) Analysis: Dr. E Sreevalsan, Dr. Sidharth Sankar Das, Shri. R. Sasikumar & Shri. M. P. Ramesh, Proceedings of 5th World Wind Energy Conference-cum-Exhibition-2006 (WVEC-2006) held at New Delhi during 6-8 November 2006.

Selected Lectures in Conference and Seminars

Research & Development

✦ Shri Rajesh Katyal, Scientist & Unit Chief:

1 Recent Development of Wind Energy at Aarupadai Veedu Institute of Technology, on 15.02.2007.

2 Towers and Foundation Concepts on 09.11.2006 during 4th National Training Programme on "Wind Power Development and Related Issues".

✦ Shri S. Suresh Babu, Technician, presented a lecture on "Electrical Aspects in Grid Integration" on 10.11.2006 during 4th National Training Programme on "Wind Power Development and Related Issues".

Wind Resource Assessment

✦ Dr. E. Sreevalsan, Scientist & Unit Chief:

1 A lecture on "Wind Structure and Statistics" on 10.11.2006 during 4th National Training Programme on "Wind Power Development and Related Issues".

2 A lecture on "Wind Power Potential in Kerala" at Trivandrum. Work shop for media persons organized by WISE, Pune.

✦ Dr. Sidharth Sankar Das, Scientist presented a paper on "Wind Farm Site Assessment Using Measure - Correlate - Predict (MCP) Analysis" in 5th World Wind Energy Conference - cum - Exhibition - 2006 (WVEC-2006) held at New Delhi during 6-8 November 2006.

Wind Turbine Testing

✦ Shri S. A. Mathew, Unit Chief in charge, presented a paper about "Power Performance" at National Training Programme held at Pune.

✦ Shri R. Kumaravel, Scientist

1 Presented a paper about "Load Measurement & Classification of Wind Turbine" at National Training Programme held at Pune.

2 Presented an activity about C-WET and Wind Energy Technology at the function of society for Energy Engineers & Managers at Kanyakumari.



3 Presided over the valedictory function of "Electra 2006" a National level technical symposium held at S. A. Engineering College, Chennai.

4 Presented a lecture on "Wind Energy and its Technology" at Tamilnadu Water and Sewage Department at Chepauk, Chennai.

5 Presented a lecture about "Wind Energy and its Application" at Kongu Engineering College, Erode on 12th February 2007.

✦ **Standard and Certification**

1 Shri.A.Senthil Kumar, Unit Chief (i/c), A Presentation on "Wind Power Development in India" at KCG College of Technology, Chennai, covering the advantages of using certified wind turbines and their contribution to success of wind power development in India.

2 A Lecture on "Wind Turbine Certification System" during the Fourth National Training Programme held in Pune, organized by C-WET.

✦ **Shri.S.Arulselvan, Technician:**

1 A lecture on "Types of Generators" during the Fourth National Training Programme held in Pune, organized by C-WET.

2 A lecture on "Control and Protection System" during the Fourth National Training Programme held in Pune, organized by C-WET.

Conferences, Meetings and Training attended by the C-WET Staff

Research & Development

1 Shri. Rajesh Katyal, Shri. K. Boopathi, Smt. Deepa Kurup and Shri.S. Sureshbabu, Lecture on "Grid Integration of Wind Turbines" on April 5, 2006.

2 Shri. K. Boopathi, Smt. Deepa Kurup and Shri. S. Sureshbabu, "Delphi 7 Application Development Course" at C-WET, from August 21-26, 2006.

3 Shri. Rajesh Katyal and Smt. Deepa Kurup, Training course on "Wind Atlas, Analysis and Application Programme" from January 5-8, 2007.

4 Shri. Rajesh Katyal and Shri. K. Boopathi, Advanced course on "Analysis and Design of Structures for Wind and Seismic Loads" at SERC, Chennai from February 7-9, 2007.

5 Shri Rajesh Katyal and Shri. K. Boopathi, Two - days seminar on "Rain Flow Cycle Counting for Fatigue Analysis" at C-WET, February 23-24, 2007.

6 Shri Rajesh Katyal, QMS-Lead Auditors Training Course for ISO 9001:2000 on 11th to 15th December, 2006.

Wind Resource Assessment

1 Dr. E. Sreevalsan, Dr. Siddarth Shankar Das, R. Sasi kumar and Smt. T Arivukkodi Training course on "Wind Atlas, Analysis and Application Programme" from January 5-8, 2007.



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- 2 Dr. E. Sreevalsan, and Dr. Siddarth Shankar Das: International Training Course on "GH Wind Farmer" from February 5-8, 2007.

Wind Turbine Testing

- 1 Shri.S.A.Mathew and Shri.R.Kumaravel has attended the training programme on WASP conducted by RISO held at our premises on 5th, 6th & 7th January 2007.
- 2 Shri.S.A.Mathew, Shri.R.Kumaravel and Shri.J.C.David Solomon and Testing Unit Project Assistant has attended the training programme on "Inter Laboratory Comparison Proficiency Testing and Evaluation of Z - Scores" conducted by Bureau of Indian Standards held at Bangalore on 24th and 25th January 2007.
- 3 Shri.S.A.Mathew, Shri.M.Anvar Ali, Shri. R.Kumaravel and Shri.J.C.David Solomon has attended the Training Programme about Measurement Uncertainty conducted by, Indian Institute of Quality Management held at Jaipur on 5th, 6th & 7th of February 2007.
- 4 Testing Unit Project Assistant has attended a Training Programme about Data Acquisition and Industrial Pc at Park Hotel, Chennai.

Standard and Certification

- 1 DELPHI 7.0 training has been attended by S&C unit members.
- 2 Shri.A.Senthil Kumar, Unit Chief (i/c) and Deputy Management Representative has become the Qualified Lead Auditor through participation in the Lead Auditor Training Programme as per ISO 9001:2000.

- 3 Training on WASP 8.3 conducted by RISO National Laboratory, Denmark, has been attended by Shri.A.Senthil Kumar and Shri.S.Siva Kumar. Shri.A.Senthil Kumar, Unit Chief (i/c), S&C has passed the certification examination conducted by RISO and has become the certified WASP user.
- 4 Shri. V.R. Gireesh Kumar has attended an advanced course on "Analysis and Design of Structures for Wind and Seismic Loads".
- 5 Shri.A.Senthil Kumar and Shri. V.R. Gireesh Kumar attended a Lecture on "Rainflow Cycle Counting Technique for Fatigue Analysis".

Information, Training and Commercial Services

- 1 Shri. P. Kanagavel, Scientist has attended 2 days Workshop on "Right to Information Act 2005" from 22-23rd May 2006 organized by the Industrial Management Academy, New Delhi.
- 2 Shri. P. Kanagavel has attended 2 days workshop on "Digital Library Initiatives using Dspace and GSDL" on 16-17th March 2007 conducted by B.S. Abdur Rahman Crescent Engineering College, Chennai.

Administration

- 1 Shri D. Lakshmanan, GM (F&A) has attended 2 days Workshop on "Right to Information Act 2005" from 22-23rd May 2006 organized by the Industrial Management Academy, New Delhi.



- 2 Shri. R. Girirajan, Assistant has attended 2 days workshop on "Inventory and Stores Management" on 22nd & 23rd December 2006 organized by Management Study Centre, Chennai.
- 3 Smt. R. Vijayalakshmi, Assistant has attended one day workshop on "Value Added Tax" on 16.12.2006 organized by Management Study Centre, Chennai.
- 4 Shri R. Girirajan, Assistant has attended one day workshop on "Value Added Tax" on 16.12.2006 organized by Management Study Centre, Chennai.

Vigilance Awareness Week

Vigilance awareness week for year 2006 was observed in C-WET between 6th to 10th November 2006 and all the employees have taken a pledge as indicated by the Central Vigilance Commission.

Constitution of Committee

In pursuance of Government instructions, a Complaints Committee for women for redressal of complaints concerning sexual harassment in work place has been constituted and no complaints received during the year 2006-07.

Promotions during the year 2006-2007

Sl.No.	Name	Previous Cadre and scale of pay	Promoted Cadre and Scale of pay	Date of promotion
1	Ms. Deepa Kurup	Junior Engineer 5500-175-9000	Scientist 'B' 8000-275-13500	24.01.2007
2	Shri S. Arulselvan	Technician 4000-100-6000	Junior Engineer 5500-175-9000	01.01.2007
3	Ms. T. Arivukkodi	Technician 4000-100-6000	Junior Engineer 5500-175-9000	01.01.2007
4	Shri A.R. Hasan Ali	Technician 4000-100-6000	Junior Engineer 5500-175-9000	01.01.2007
5	Shri Y. Packiyaraj	Technician 4000-100-6000	Junior Engineer 5500-175-9000	01.01.2007
6	Shri M. Karuppuchamy	Technician 4000-100-6000	Junior Engineer 5500-175-9000	01.01.2007



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, MNRE, New Delhi, Chairman
- 2 Dr. V. Siddhartha, Chairman, R&D Council, C-WET, Ministry of External Affairs (Formerly Outstanding Scientist, DRDO, Ministry of Defence, New Delhi), Member
- 3 Shri. A. K. Rath, Financial Adviser, MNRE, New Delhi, Member
- 4 Shri. R. Satapathy, Special Commissioner & Secretary to Govt., Energy Department, Govt. of Tamil Nadu, Secretariat, Chennai, Member
- 5 Shri Alka Sirohi, 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, C/o National Aerospace Laboratories, Bangalore, Member
- 10 Mr. K. P. Sukumaran, Scientist 'G' & Head, Wind Energy Group, MNRE, 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, MNRE
- 3 Executive Director, C-WET



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Finance Committee

The following are the members of the Finance Committee (To review the financial performance of the Centre):

- | | | |
|---|--|--------------------|
| 1 | Shri. A. K. Rath, Financial Adviser, MNRE, | - 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 | Director (WE), MNRE, New Delhi, , | - Member |
| 5 | Director (Finance), MNRE, 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 |

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, Ministry of External Affairs (Formerly Outstanding Scientist, DRDO, Ministry of Defence, New Delhi, | - Chairman |
| 2 | Shri. K. P. Sukumaran, Scientist 'G', Advisor, Wind Power, MNRE, 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, 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 |



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Revised List of Models and Manufacturers (RLMM) Committee

The following are the members of the Revised List of Models and Manufacturers (RLMM) Committee:

- | | | |
|---|--------------------------------------|------------|
| 1 | Executive Director, C-WET, | - Chairman |
| 2 | Adviser (Wind Energy), MNRE, | - Member |
| 3 | Chairman, IWTMA, Chennai, | - Member |
| 4 | Hon'y. Vice Chairman, IWPA, Chennai, | - Member |
| 5 | Unit Chief, S&C, C-WET, | - Member |

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. D. Lakshmanan, General Manager, | - Member |
| 4 | Admin & Accounts Officer, | - Member |
| 5 | Mr. P. Kanagavel, Scientist, | - Member |
| 6 | Mr. R. Kumaravel, Junior Engineer, | - Member |
| 7 | Mr. S. Suresh Babu, Technician, | - Member |



HUMAN RESOURCE

M. P. Ramesh, Executive Director

Research & Development

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

Wind Resource Assessment

E. Sreevalsan, Unit Chief, WRA/ITCS
Siddarth Shankar Das, Scientist
R. Sasikumar, Meteorologist
T. Arivukkodi, Junior Engineer
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, Scientist
M. Karuppuchamy, Junior Engineer
A. R. Hasan Ali, Junior Engineer
Y. Packiyaraj, Junior Engineer

Standards and Certification

A. Senthil Kumar, Unit Chief In-Charge
V. R. Gireesh Kumar, Scientist
S. Sivakumar, Scientist
S. Arulselvan, Junior Engineer

Information, Training and Commercial Services

P. Kanagavel, Scientist
M. R. Gunasekaran, Steno

Administration

D. Lakshmanan, General Manager (F&A)
R. Girirajan, Assistant
R. Vijayalakshmi, Assistant
K. Tamilselvi, Assistant
B. Muthulakshmi, Steno
M. Malaravan, Driver
M. Selvakumar, Attendant



C-WET Officials on External Committees/ Membership of Associations / Bodies

M. P. Ramesh

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

D. Lakshmanan

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

Rajesh Katyal

1. Member of the Institution of Engineers (India).

E. Sreevalsan

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

A. Senthil Kumar

1. Member of the Wind Turbine Sectional Committee - ET 42 of Bureau of Indian Standards.

V. R. Gireesh Kumar

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

R. Kumaravel

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

P. Kanagavel

1. Member of the Society for the Advancement of Library and Information Science (SALIS).



C-WET
Centre for Wind Energy Technology, Chennai

AUDITORS REPORT

R. JANAKIRAMAN & CO. Chartered Accountants

Partners

R. Janakiraman, B.Com., F.C.A.,

J. Chandrasekaran, B.Sc., F.C.A.,

C. Geetha, B.Com., A.I.C.W.A., F.C.A. D.I.S.A.

C. Shanmukham, B.Com., F.C.A.,

B. Chandran, B.Com., F.C.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-600 100

We have audited the attached Balance sheet of Centre For Wind Energy Technology (C-WET) Velachery - Tambaram Main Road, Pallikaranai, Chennai - 600100 as at March 31, 2007 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.

Contd..

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



R. JANAKIRAMAN & Co.,

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, 2007; 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 : 08/07

Place : Chennai

For R. JANAKIRAMAN & COMPANY
Chartered Accountants

R. JANAKIRAMAN
PARTNER
(Membership No. 5129)





CWET

Centre for Wind Energy Technology, Chennai

CENTRE FOR WIND ENERGY TECHNOLOGY
(An Autonomous R&D Institution under MNRE, Government of India)
Chennai – 600 100

BALANCE SHEET AS AT 31ST MARCH, 2007

(Amount in Rs.)

CAPITAL FUND AND LIABILITIES	Schedule	31st Mar 2007	31st Mar 2006
CAPITAL FUND	1	56,186,291	69,302,364
EARMARKED - PROJECTS	1A	30,516,574	19,997,690
UNSPENT BALANCE OF GRANTS IN HAND	1B	216,127	56,041,611
RESERVES AND SURPLUS	2	68,835,196	50,907,362
CURRENT LIABILITIES AND PROVISIONS	3	45,074,386	29,024,342
TOTAL		200,828,574	225,273,369
ASSETS			
FIXED ASSETS			
(a) Created out of Central Governments Grants	4	65,457,262	74,062,118
(b) Created out of Own Resources - Projects Funds		641,165	0
CURRENT ASSETS, LOANS AND ADVANCES	5	134,730,147	151,211,251
MISCELLANEOUS EXPENDITURE (to the extent not written off or adjusted)	-	0	0
TOTAL	-	200,828,574	225,273,369
SIGNIFICANT ACCOUNTING POLICIES	13		
NOTES ON ACCOUNTS	14		

For Centre for Wind Energy Technology

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

Sd/ D. Lakshmanan General Manager (F&A)	Sd/ M. P.Ramesh Executive Director	Sd/ President / Chairman
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Sd/
(R. JANAKIRAMAN)
Partner



Centre for Wind Energy Technology, Chennai

CENTRE FOR WIND ENERGY TECHNOLOGY
(An Autonomous R&D Institution under MNRE, Government of India)
Chennai – 600 100

INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED 31ST MARCH, 2007

(Amount in Rs.)

INCOME	Schedule	Current Year	Previous Year
Income from Scientific & Technical Consultancy Services	6	17,999,965	25,661,824
Income from publication	7	1,274,510	341,400
Interest Earned	8	6,360,156	3,845,177
Other Income	9	1,230,670	342,135
Unspent Grants from Government of India allocated for Revenue expenditure during the year		20,086,624	17,729,907
Unspent Grants from Government of India allocated for In house project expenditure during the year		23,951,860	2,405,440
Deferred Income transferred from General Reserve (vide note no.4)		13,116,073	13,420,190
TOTAL (A)		84,019,858	63,746,073
EXPENDITURE			
Establishment Expenses	10	8,516,892	8,355,427
Other Administrative Expenses	11	20,503,967	12,052,605
In house project expenditure		23,951,860	2,405,440
Depreciation	4	13,116,073	13,420,190
TOTAL (B)		66,088,793	36,233,662
Balance being excess of income over Expenditure (A-B)		17,931,066	27,512,410
Prior period adjustment	12	3,232	53,230
BALANCE BEING SURPLUS TRANSFERRED TO GENERAL RESERVE ACCOUNT		17,927,834	27,459,180
SIGNIFICANT ACCOUNTING POLICIES	13		
NOTES ON ACCOUNTS	14		

For Centre for Wind Energy Technology

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

Sd/
D. Lakshmanan
General Manager (F&A)

Sd/
M. P.Ramesh
Executive Director

Sd/
President / Chairman

Sd/
(R. JANAKIRAMAN)
Partner



CWET

Centre for Wind Energy Technology, Chennai

CENTRE FOR WIND ENERGY TECHNOLOGY
(An Autonomous R&D Institution under Ministry of New & Renewable Energy, Government of India)
Chennai 600 100

RECEIPTS AND PAYMENTS ACCOUNT FOR THE YEAR ENDED 31ST MARCH, 2007

	(Amount in Rs.)	
RECEIPTS	31st March 2007	31st March 2006
I. Opening Balances		
(a) Cash in hand		
(b) Bank balances		
i) In Current Account	11,640,254	11,316,180
ii) In Deposit Accounts	126,797,906	62,680,372
(c) Stamps on hand	8,076	700
II. Grants Received		
(a) From Government of India		40,000,000
(b) From interest earned on Grants-in-aid	910,000	
(b) From Government of India for execution various projects	20,434,217	21,800,000
(c) From Government of India for organising international training programme		629,423
III. Income on Investments		
IV. Interest Received		
(a) On Bank deposits	6,360,156	3,845,177
V. Other Income		
(a) Fees for services	16,765,154	16,575,807
(b) Income from publications	1,274,510	341,400
(c) Energy receipts	3,954,296	6,255,536
(d) Misc. income	974,402	300,108
VI. Amount borrowed		
VII. Any other receipts		
(a) Fees received in advance on Consultancy projects	11,106,198	5,486,367
(b) Other advance recovered (festival advance)	1,050	3,150
(c) Amt received in excess from DANIDA & repayable		
(d) Security deposit received	873,300	210,000
(e) Earnest money deposit received	1,670,000	925,000
(f) Service Tax realized	4,629,822	3,326,474
(g) TDS to be remitted	14,207	36,806
TOTAL	207,413,548	173,732,500

For Centre for Wind Energy Technology

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

Sd/
D. Lakshmanan
General Manager (F&A)

Sd/
M. P. Ramesh
Executive Director

Sd/
President / Chairman

Sd/
(R. JANAKIRAMAN)
Partner



Centre for Wind Energy Technology, Chennai

PAYMENTS	(Amount in Rs.)	
	31st March 2007	31st March 2006
I. Expenses		
(a) Employee related Expenses	8,503,523	7,847,447
(b) Administrative Expenses - (Operational & TA/DA)	12,294,116	10,620,061
II. Payments made against funds for various projects		
Out of CFA		
(a) In house R&D project expenses	6,048,744	1,072,297
(b) Research support to WRA	116,000	403,416
(c) HRD and manpower training	57,994	330,804
(d) Seminar & Information dissemination	405,150	188,480
(e) Accreditation fee	103,942	51,709
(f) Enhancement of test facilities	16,402,500	
(g) Other expenses	2,290	
(g) Advance for execution of projects	12,673	98,350
Out of Grants for projects		
(a) International training programme		804,216
(b) Parameterisation of WT		600,000
(c) Scanning of wind profile in Palghat gap	293,248	3,043,867
(d) Wind Shear Assessment expenses	460,264	1,546,172
(e) North-Eastern Project	239,300	918,406
(f) Micro-survey & preparation of Master Plan		
(g) Study on Uncovered / New areas (2003-04 & 2004-05)	10,453,306	3,721,715
III. Investment and Deposits made		
IV. Expenditure on Fixed assets & Capital Work-in-Progress		
(a) Purchase of Fixed assets	4,752,416	13,100,831
(b) Expenditure on Capital Work-in-progress	3,500	-3,950,853
(c) Advance on capital account (including imports)	-2,123,093	-7,535,058
V. Refund of Surplus Money		
(a) Balance of Grants-in-aid to Government of India	12,697,000	
VI. Other Payments		
(a) Refund of Security deposits	10,000	30,000
(b) Refund of Earnest Money Deposits	1,145,000	470,000
(c) Expenditure on Consultancy Projects	7,089,823	1,247,732
(d) Advance on Consultancy projects	145,935	-2,177,704
(e) Advance & Deposits	321,021	-525,796
(f) Payment of TDS	36,806	
(g) Prior period expenses	3,232	53,230
(h) Service tax remittances	4,629,822	3,326,943
(i) Festival advance paid		
VII. Closing Balances		
(a) Cash in hand		
(b) Bank Balances		
i) In Current Account	22,479,669	11,640,254
ii) In Deposit Accounts	99,922,247	126,797,906
(c) Stamps on hand	7,119	8,076
TOTAL	207,413,548	173,732,500

For Centre for Wind Energy Technology

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

Sd/
D. Lakshmanan
General Manager (F&A)

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Executive Director

Sd/
President / Chairman

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(R. JANAKIRAMAN)
Partner

