



वार्षिक प्रतिवेदन ANNUAL REPORT 2003 - 2004



C-WET

पवन ऊर्जा प्रौद्योगिकी केन्द्र

CENTRE FOR WIND ENERGY TECHNOLOGY

(अपारम्परिक उर्जा स्रोत मंत्रालय के अधीन स्वायत्त अनुसंधान एवं विकास संस्था, भारत सरकार)

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

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CENTRE FOR WIND ENERGY TECHNOLOGY

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.

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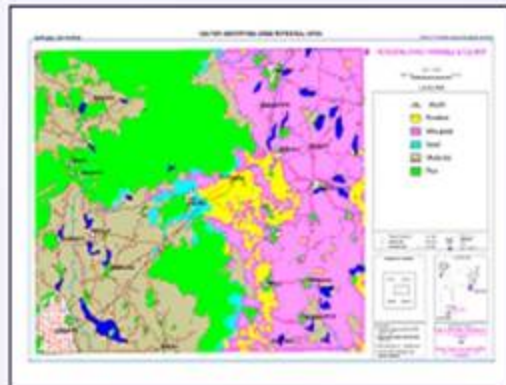
EXECUTIVE DIRECTOR'S REPORT

The financial year 2003-04 saw culmination and deployment of knowledge base gained over the first five years of C-WET's establishment. There were many hard won lessons about how to handle the rather complex needs of the industry in a seamless manner. With Danish International Development Agency (DANIDA) project approaching completion, the emphasis was on getting the Centre its accreditation both as a measuring laboratory and certifying agency. This year an institutional development plan was prepared under the DANIDA project with a view to measuring the training received and utilizing the training so received in an effective manner for sustainability of C-WET in the near and long term.

RESEARCH AND DEVELOPMENT

A number of initiatives have been undertaken to address the five generic areas identified by the Research and Development (R&D) Council of C-WET. Under research for wind resource assessment, a project was undertaken together with the National Remote Sensing Agency (NRSA) to develop and validate a methodology to identify wind farmable areas more precisely than in the past. The need to do this was to use the more recent information on the ground than what is shown in the Survey of India (SOI) maps. While the basis would remain to be the same, the SOI maps would not accurately represent the ground reality regarding forest cover, lakes and other features, which would have changed subsequent to the map preparation. Apart from this, a more precise idea on the soil

conditions and other details would become available through a careful analysis of satellite imagery.





model needs to be validated. The measurement and analytical tools were procured for carrying out these validations in field. In order to be ready with the know-how and know-why's of noise measurements, suitable equipments have been procured. This is an area not presently an issue due to the small distribution as well as remoteness of wind farm areas. But in the near future this will be an issue to be tackled both in terms of safety of O&M personnel and noise pollution in general. The sectoral R&D meeting of MNES also resulted in discussions between Bharat Heavy Electricals Limited (BHEL), Indian Wind Turbine Manufacturers' Association (IWTMA) wishing to go into exploration of the effectiveness of BHEL's reactive power compensator.

WIND RESOURCE ASSESSMENT

Some of the notable achievements of the year are the progress made on identification of locations in uncovered areas for setting up 50 m tall masts. Two major departures under this program were (a) to go in for 50 m masts instead of the 25 m masts keeping in line with the present day wind turbine sizes; (b) to involve state nodal agencies right from site selection to maintenance of the stations at the local level. In the past, the role of state nodal agency was to provide logistic support alone. For the North Eastern States, the hardware including monitoring equipment have been dispatched to the concerned state nodal agency. Civil works for establishment of monitoring stations have been completed in many states. The States of Sikkim and Nagaland have expressed interest in joining the program. Action has been initiated to include these two states. With

the state nodal agencies showing much interest in the site specific micro-survey reports, ten more master plans have been prepared taking the total number of known windy locations for which micro-survey reports are available to 97. Apart from these initiatives, Tamilnadu Energy Development Agency requested C-WET to prepare similar documents for two more stations. Under the Consultancy projects, C-WET has taken up wind monitoring, for Karnataka Renewable Energy Development Agency and Maulana Azad National Institute of Technology, Bhopal. The Centre was asked to verify data collection procedures adopted by private establishments and authenticate the procedures adopted. This would enable the state nodal agencies to accept the data used for energy estimation. A number of assignments were undertaken to carry out due diligence studies on wind farming proposals. Many micro-siting assignments were also undertaken for private and government wind farms. All the wind farms so designed have been delivering energy at the levels estimated.

WIND TURBINE TESTING

Quality of power delivered by wind turbines to the grid is becoming an issue from the point of view of localized concentration of wind turbine installations at specific sub-stations. It is all the more important in the context of more and more use of power electronics in terms of AC/DC/AC routes, far more stringent requirement of power factor compensation. Although it is not a primary requirement of IEC standards for testing, it is likely to create disputes between State Electricity Boards (SEBs) and wind farming community and even among manufacturers.



Under the DANIDA project, RISO engineers trained the unit in carrying out power quality measurements.

The wind turbines on which testing could not be completed during the year 2002-03 due to delayed installation continued to be positioned at C-WET test station. All the tests inclusive of power performance, load measurements, frequency spectrum analysis, and other tests were conducted. In addition, two field test assignments were undertaken in complex and semi-complex terrains at customer's request. The complex nature of the site resulted in the test sites not meeting IEC criterion completely. However, the tests were not meant for type certification and therefore the IEC criterion was used more as a guide than as a mandatory need. The unit prepared the National Application Documents to be used in conjunction with the IEC standard referring to the performance evaluation of wind turbines (61400-12). The unit also has started functioning as per the needs of IEC 17025 and has in place necessary quality system to go in for National Accreditation Board for Testing and Calibration Laboratories (NABL) accreditation.

STANDARDS & CERTIFICATION

The unit in pursuit of excellence, the Centre's ambition, has co-ordinated preparation of a Quality Management System (QMS) for three units namely Wind Resource Assessment (WRA), Testing and Standards & Certification (S&C), with the aim of obtaining the ISO 9001:2000 Certification. Noting that keeping a unified quality system is more beneficial in the long run, the quality manual was

updated by including the ISO/IEC 17025 requirements. ISO/IEC 17025 requirements concentrate on the competence of measurement and analysis in addition to the need of a working quality system.

Type Approval Scheme (TAS) has been prepared in association with RISO National Laboratory, Denmark. It is expected that this would replace the Type Approval Provisional Scheme (TAPS-2000). The revision is based on the experience gained over the past four years. Detailed consultations were held with various stakeholders during preparation of the TAS. The aspirations, expectations, checks and balances needed have been built into the system. The draft document has been forwarded to the Ministry of Non-Conventional Energy Sources for approval and adoption.

Complementary to establishing the certification system, the matter of setting up testing and certification standards has also been taken up. As is the international practice, the IEC standards would be adopted as the basis and additional requirements spelt out in the form of National Application Documents (NADs). Three normally used NADs have been prepared in association with RISO scientists and test unit engineers and the matter has been referred to the Ministry for taking up with Bureau of Indian Standards (BIS). Once the formal procedures are followed, the IEC standards to be read together with the corresponding NADs would be adopted by BIS.

Two prestigious wind turbine manufacturers namely NEG Micon India Limited and Chiranjeevi Wind Energy Limited offered their wind turbines for



Category-I certification. One Category-III certification, wherein the full design evaluation is carried out, is in process.

In terms of capacity addition, the unit was strengthened with a senior structural engineer. Under the DANIDA project, a versatile stress analysis package was obtained and scientists were trained to use them. There were two stints of RISO resident scientists helping the unit in preparation of QMS, TAS, NADs as well as filling in the gaps in training on various aspects of analysis for certification.

INFORMATION, TRAINING AND COMMERCIAL SERVICES

R & D Council recommended that C-WET should arrange to prepare Syllabus for a Masters degree course in Wind Energy and nominated Prof. Sujay Basu, Director, School of Energy Studies, Jadavpur University, Kolkata. This committee consisting of University, IIT professors and Industry formulated a three-semester Master Degree course in Wind Turbine Technology that can be offered to B.E., B.Tech., graduates from any of the basic streams (Civil, Electrical and Mechanical). This syllabus has been submitted to Ministry for taking up with All India Council for Technical Education (AICTE).

MNES sponsored international training program on "Wind Turbine Technology and Applications" was organized for the first time. The program attracted fifteen participants from seven countries. A large contingent was from the middle eastern countries. The course content was carefully designed with visits to manufacturing facilities, wind farming areas. Basic and advanced topics in wind resource assessment, testing, O&M aspects, standardization were introduced. The faculty consisted of C-WET scientists and practicing engineers from the industry. Apart from the normal scientific inputs, product information on Indian wind turbines, services available were all showcased.



The <http://www.cwet.tn.nic.in> started functioning on a trial basis.

C-WET moved from its Anna Nagar office to its own facilities at Pallikaranai on 22nd March 2003.



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 Resources 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, 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 all 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 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 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 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 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 monitor the field performance of wind power systems, sub-systems and components, effectively utilize this feedback for fulfilment of the above



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- objective and issue of certification, establish and update the data bank on a continuous basis and serve as information centre for selective dissemination.
- To promote commercial exploitation of know-how, know-why results and offer various consultancy services to the customers.
- To undertake human resource development programmes for the personnel working in the wind energy sector.
- To promote the development and commercialisation of any other wind energy systems including stand-alone systems.



CENTRE FOR WIND ENERGY TECHNOLOGY

From the Units





RESEARCH AND DEVELOPMENT

This unit has been concentrating on in-house R&D and also co-ordinating R&D programmes with academic institutions, industry, experts and consultants working in varied disciplines. The objective of this is to create and nurture applications oriented R&D for the overall benefit of the wind sector and lead the manufacturing industry towards production of cost effective, high quality wind power systems. C-WET provides organizational support to the wind energy sector through its R&D unit so as to achieve and maintain world class technology options in the area.

The R&D unit is carrying out projects under the following generic areas as laid down by the R&D Council :

I. Improvement of performance of existing Wind Turbine installations

- Recommendation on design and maintenance of Gearboxes of Wind turbines
- Parameterisation of flow distortion around Wind turbine nacelle

II. Research in Wind Resource Assessment

- Study of wind flow pattern across Palghat Gap

III. Advanced Wind Turbine Technology

- Development and validation of design methodologies and design tools for low and moderate wind regimes
- Study on grid penetration of Wind Farms

I. Improvement of performance of existing Wind Turbine installations

1. Recommendation on design and maintenance of Gearboxes of Wind Turbines : Through this project, the findings and recommendations of the

project on "Failure Analysis of Gearboxes of Wind Turbines" will be generalized, without naming any party in particular. The project has been awarded to Centre for Energy Technology, Osmania University, Hyderabad.

The salient findings of this study are with respect to the lubricant oil used in Wind Turbine Gearboxes. Both mineral oil as well as synthetic oil are generally used as gear oil. As per the recommendations given in the report, use of mineral oil should be avoided due to lower viscosity. However, if it has been used due to its lower cost, it should be restricted to 500 kW wind turbines and frequently changed between one to two years based on test results. In case of synthetic oils, rust on oxidation (R&O) inhibitor additives should not be used. As Wind Turbine Gearboxes are boundary lubricated, antiscuff additives must be used and gear oil must be tested every year.

Further work has to be carried out in this area concentrating on the following:

- Suitability of mineral oil as gear oil.
- Identification of few gear oils that can be used in gearboxes of Wind Turbines in India, based on criteria such as suitability, performance, indigenous availability, cost etc.
- Identification of additives required and their percentages.

- Formulation of Test procedures, parameters to be tested and their limits for gear oil.
- Identification of test facilities to carry out such work.

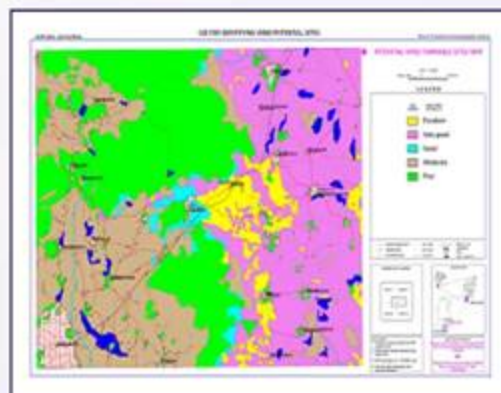
2. Parameterisation of flow distortion around Wind turbine nacelle : This project aims at studying the dynamics of wind flow around the nacelle body and to determine the position of free stream wind near the nacelle body through a wind tunnel experiment. This would provide the basis for positioning the anemometer on the top of the nacelle for site calibration experiments in the future for power performance measurement. This will also assist in correcting the measured power curve for terrain conditions.

II. Research in Wind Resource Assessment

1. GIS for identification of wind potential sites:

When large areas are to be scanned for determining potential areas, it is essential to use remote sensing. The development of Global Information System (GIS) application will be in two parts: (1) Development of a GIS database using the data of an existing wind monitoring station and (2) Development of a GIS query shell for locating wind potential sites. Wind mapping will be based on the spatial information on natural resources such as landuse / land cover, slope, geology / geomorphology / geotechnical and drainage using satellite data on a 1:50000 scale. The study has been initiated together with the National Remote Sensing Agency (NRSA), Hyderabad for the Muppandal area in

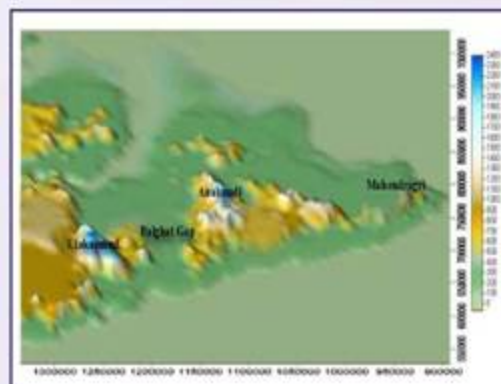
Tamil Nadu. NRSA has already submitted the draft report and the final report is expected beginning of next year.



Map generated through GIS for identifying wind potential site .

2. Study of wind flow patterns in Palghat Gap:

The aim of the project is to collect the three dimensional wind profile in the Palghat Gap area to study the behavioural aspects of the winds in the whole region using Sound Detection And Ranging (SODAR). A SODAR system is an instrument for the measurement of wind profile, remotely from the ground by sending acoustic pulses vertically and at a small angle to the vertical.



A 3-D view of the Palghat Gap and other regions in Southern India.



The received signals are analyzed in terms of frequency shift produced by the Doppler effect to determine the wind velocity. This will be done by profiling the three-dimensional wind flow in the Palghat Gap region especially upto 1000m with resolution of 5m for lower levels and 10m for levels beyond 100m upto 1km. This study is expected to give an insight into the wind flow physics in mountain passes and identified windy areas.

III. Advanced Wind Turbine Technology

1. Development and validation of design methodologies and design tools for low and moderate wind regimes: The objective of this proposal is to generate an indigenous design databank for the development of low cost, technologically advanced wind turbine blades/rotors specifically for low/moderate wind regimes and dusty environment. The project envisages:

- i) Survey of Existing Profiles employed for wind turbine blades.
- ii) Survey of existing modeling strategies for wind turbine aerodynamics.
- iii) Evolving new modeling strategies incorporating in-house computational schemes along with augmentation.
- iv) Carrying out blade/rotor performance studies with these improved methods.
- v) Carrying out the related wind tunnel and water tunnel studies.

As per the suggestions of the R&D Council during its sixth meeting, a committee of experts was proposed to be constituted with Dr. Kota Harinarayana, Vice-Chancellor, Hyderabad University as the Chairman to review the proposal.

Further to the recommendations of the Review Committee Meeting, the Chairman, R&D Council had suggested changes in the proposal. Revised proposal was approved in the seventh meeting of R&D Council. A Memorandum of Understanding (MoU) has been entered into with National Aerospace Laboratories, Bangalore with regard to the project.

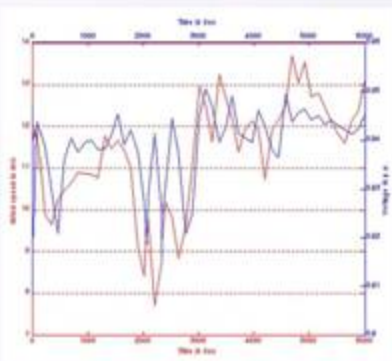
2. The project report on Grid related investigations of wind turbines was submitted for approval of R&D Council during its seventh meeting. The R&D Council had directed that C-WET should carry out mathematical simulation as well as experiments simulating field conditions in the laboratory.

Further to this, it was decided in the Meeting on "Study and Penetration of Wind Power Projects and their impacts on Existing Grids" organised by MNES on November 7, 2004 that a study is to be carried out on "Grid Penetration of Wind Farms". C-WET is presently carrying out the study through simulations on SimPowerSystems in Matlab environment. The main aim of this project is to develop a model of grid connected wind farm, consisting of constant speed wind turbines, in order to study the planning and control strategies involved in the implementation of a wind farm.

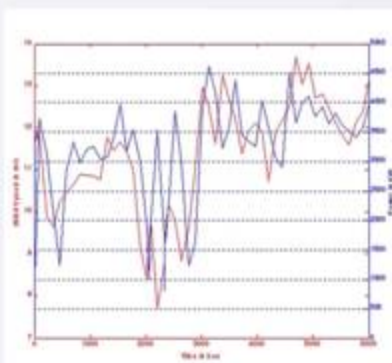


*Experts at discussion
in the R&D Sectoral Meeting Wind Energy.*

Graph showing Simulation results for
15 wind turbines connected to the grid system.



Voltage Vs Wind speed



Wind farm output (kW) Vs Wind speed

New Infrastructure

As per IEC 61400-11, Wind turbine generator systems – Part II: Acoustic noise measurement techniques, a uniform methodology that will ensure consistency and accuracy in the measurement and analysis of acoustical emission by wind turbines, is to be followed for the benefit of those parties involved in the manufacture, installation, planning and permitting, operation, utilization, and regulation of WTs. Hence characterization of a range of wind turbine noise with respect to a range of wind speeds is required. The purchase of Sound level meter, which will help in such noise measurements and analysis, is underway.

The performance of wind turbine installations can be studied and improvements suggested based on measurements carried out in field. Suitable Data Acquisition System has been ordered to facilitate acquisition of such field data and further analysis.

Software like Control System Toolbox for Matlab, SimMechanics Toolbox for Matlab, Simulation performance Toolbox for Matlab, AutoCad 2004 and BLADED have been procured for R&D laboratory. The Matlab range of software will enable simulation of wind turbines taking into account the electrical, mechanical and control parameters and supplement the real time measurements. The BLADED software was purchased for "Development and validation of design methodologies and design tools for low and moderate wind regimes".



WIND RESOURCE ASSESSMENT

Reliable wind measurement is an important input for analysis of wind resources at a location. It is a key constituent of the wind power programme aiming at large-scale commercialization of cost effective generation of grid-quality power. Time series data on wind speed and direction are the basic data to assess the resource available at a site. The frequency distribution derived from these data is the important parameter to calculate the magnitude of wind energy generation. The wind resource assessment programme involves

(a) Identification of candidate locations in conjunction with contour maps and other factors available data from a region. (b) Establishment of wind monitoring stations with appropriate mast height and with multilevel instrumentation. (c) Collection and analysis of time series data on wind speed and direction. The number of wind monitoring stations established under MNES and various other consultancy projects in the country as on March 31, 2004 is 469. Presently, 32 stations are in operation and the state-wise details are given in the Table below:

Wind Monitoring stations in India (2003-04)

S. No.	State	Number of Stations			
		As on 31-03-2003	Commissioned during 2003-04	Closed down during 2003-04	In operation as on 31-03-2004
1	Tamil Nadu	3	-	-	3
2	Gujarat	7	1	5	3
3	Maharashtra	5	11*	1	15
4	Andhra Pradesh	2	-	-	2
5	Rajasthan	8	-	7	1
6	Lakshadweep	2	-	1	1
7	Karnataka	2	1*	-	3
8	Madhya Pradesh	1	-	-	1
9	Jammu & Kashmir	3	-	1	2
10	Haryana	3	-	2	1
	Total	36	13	17	32

*Consultancy projects.



Apart from the Ministry sponsored wind-monitoring stations, 12 stations have also been commissioned under consultancy projects in the State of Maharashtra and Karnataka. In the North Eastern States, 21 stations have been identified and installations are in progress. Requests from many other states also have been received, at specific locations. Wind Resource Assessment along the coastal line of Kerala and at Kanyakumari has also been initiated during this year. To facilitate wind farm developers, micro-survey reports have been prepared for 12 more stations apart from the 85 stations study carried out earlier in various areas. These reports are being widely used for locating suitable areas for wind farm development. Besides these routine projects, wind farm appraisal and authentication of wind mast readings were introduced during the year 2003-04.

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 469 stations established till 31-03-2004, 211 stations have been found to have wind power density (WPD) in excess of 200 W/m² at 50magl. Details of these 211 stations are given in the Table below :

Number of Monitoring stations in different WPD ranges

WPD range [W/m ²]	Number of stations
200-250	77
250-300	60
300-350	29
350-400	15
>400	30

Wind Resource Assessment in Uncovered / New Areas

Under the MNES programme, a wind resource assessment programme has been taken up in Uncovered / New areas of states. During this period action has been initiated to commission a total of 22 stations in 12 states including Goa and the commissioning of stations will be completed by the first half of next year as finalization of sites, civil works etc. for these have been completed. To assess the wind resources available in the uncovered region, 50m tall tower with three level instrumentation are planned.

Micro-Survey Project

Preparation of micro survey reports and preparation of a master plan was initiated in 1997-98 to assess the "zones of influence" and the potential available around select wind-monitoring stations for commercial exploitation, the measured data are applicable directly to the close proximity of the location where the measurements are taken.

In order to get an idea about the resources some distance away from the monitoring station, a modeling exercise has been undertaken to extrapolate the wind resource over an extended area of 20 km x 20 km around the observation point. Micro-surveys around ten stations covering four states namely, Gujarat, Kerala, Maharashtra, Madhya Pradesh were carried out during 2003-04. Wind data analysis, estimation of wind energy potential and a master plan for the identified areas were prepared.



**Land & infrastructure identified for establishment of wind farms (50 m hub height)
Through micro-survey at 97 stations**

S. No.	State	Stations covered in during 2003-04	Total stations covered so far	Land & infrastructures identified for Wind farm in MW
1	Tamil Nadu	-	19	4993
2	Gujarat	5	20	5871
3	Maharashtra	-	18	1285
4	Andhra Pradesh	-	11	942
5	Karnataka	1	15	838
6	Kerala	2	3	638
7	Rajasthan	-	3	203
8	Madhya Pradesh	2	5	257
9	Orissa	-	2	35
10	West Bengal	-	1	-
	Total	10	97	15062.00

With this, the total wind monitoring stations covered under the micro-survey project are ninety-seven. State-wise wind monitoring stations taken up for micro-surveys till March 2004 and the estimated potential at 50magl are given in the above table. Wind Atlas Analysis Application Program (WASP) was used for the estimation.

Special study in North Eastern region

North-eastern India is considered to have low levels of wind resource potential when compared with other regions of the country as per general climatologic features. The Ministry of Non-Conventional Energy Sources sponsored a programme "Special Study on Wind Resource Assessment in North Eastern Region" initially at 21 sites in 5 states of the region for long-term wind measurements with automated recording systems. Subsequently during the period Sikkim also has been considered making the total number of sites 24 in 6 Northern Eastern states. The number of sites considered in various states are shown below. Wind

measurements at these sites with 25m masts are likely to commence in the second half of the next year as the fabrication and transportation of masts have been completed except for Sikkim during the period as well as civil works in a few states.

Sites considered for wind monitoring in the North Eastern states

S. No.	State	No. of sites
1	Arunachal Pradesh	5
2	Assam	3
3	Manipur	5
4	Mizoram	5
5	Tripura	3
6	Sikkim	3
	Total	24

Consultancy Projects

Micro-survey report for two sites in Tamil Nadu

Micro-survey analysis and master plan for the 20 x 20 km area around Rameswaram and T. Meenakshipuram wind-monitoring stations has been carried out for the Tamil Nadu Energy Development Agency. Though Rameswaram is one



of the best potential sites with 268 W/m^2 at observed level has a limitation for wind farming since its large potential areas come under coastal boundary. The wind power potential at Rameswaram has been estimated at 44 MW with an average capacity factor of 25 per cent at 70 m level. T. Meenakshipuram is comparatively moderate site for wind farming with wind power density of 188 W/m^2 at 20 m level. The area is found having very strong winds only for 5 months in a year and rest of the year winds are very poor. Three potential sites with installed capacity of 132 MW have been identified with an average capacity factor of 25% at 70 m level.

Micro siting and layout of wind farms

Micro siting and layout of the wind farm project with a total capacity of 9 MW consisting of 6 machines at Bidrekere in Chitradurga district of Karnataka was carried out for M/s Nuziveedu Seeds Limited, Hyderabad.

Appraisal of Wind Farm proposal

This assignment is to look at the wind and terrain characteristics of an identified location and determine whether the expected generation levels would be reached in the proposed wind farm. Two separate projects were carried out for M/s MSPL Limited, Hospet, Karnataka in Chitradurga range of hills and one for M/s Suguna Poultry Farms Limited at Rameswaram.

Verification of Wind Mast Readings

If a company or an individual has monitored wind data at a given place and has found to their/his satisfaction that wind resource is adequate to

qualify for certification of the wind monitoring data collected by them, they can approach C-WET to get it done with certain procedures. C-WET has carried out one exercise for Kurumaradikere Energy Ltd. for their wind mast readings at Kurumaradikere, Chitradurga district in Karnataka.

Wind Monitoring Programme

Wind Monitoring Programmes have been taken up as continued programme during the period under various consultancy projects. The details of these are as follows:

S. No.	State /stations	District	Mast height (maga)	Date of Comm.
1	MAHARASHTRA Deosai	Ratnagiri	25	17.10.03
2	Shivens	Ratnagiri	50	18.10.03
3	Ambed	Ratnagiri	50	18.11.03
4	Nerkewadi	Ratnagiri	25	19.11.03
5	Mahabunge	Sindhturug	50	15.10.03
6	Dhangarwadi	Sindhturug	25	16.10.03
7	Vahmpet	Latur	50	20.10.03
8	Bhad	Sangli	25	21.10.03
9	Kasar Sini	Latur	25	14.11.03
10	Robina	Latur	25	15.11.03
11	Murud	Latur	50	13.11.03
12	KARNATAKA Nargood	Goedag	25	09.10.03

1. Data collection from the station commissioned in Elephanta Island, Maharashtra has been completed and report submitted.
2. Eleven wind monitoring stations commissioned with 50 and 25m tall masts during October-November 2003 in the Latur/Sangli and Konkan region of Maharashtra and data collection is on.
3. Data collection from the 2 wind monitoring stations commissioned under an earlier Integrated Rural Energy Programme (IREP) programme of Maharashtra Energy

Development Agency (MEDA), Maharashtra has been completed.

4. One wind monitoring station was commissioned with a 25m tall mast in October 2003 at Nargund, Karnataka in association with Karnataka Renewable Energy Development Limited (KREDL), Bangalore.
5. Action has been initiated to commission five wind monitoring stations in A/N Islands.
6. A wind monitoring study at 2 locations has been initiated during the period with Maulana Azad National Institute of Technology (MANIT), Bhopal and the stations will be commissioned in the first half of next year.

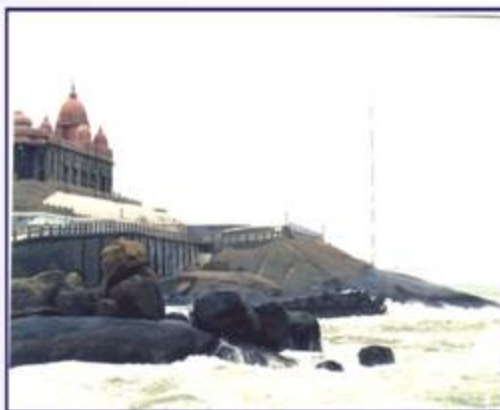


50m tall Wind Monitoring Mast being installed at Mahalunge, Konkan, Maharashtra.

Wind & Solar Studies at Kanyakumari

In order to find out the feasibility of wind and solar resources at the southern tip of main land a study at

Vivekananda Rock Memorial, Kanyakumari was initiated with technical expertise from NAL, Bangalore. A 30m tall mast was commissioned on the Rock Memorial in June 2003 to collect wind as well as solar radiation resources.



30m tall Wind/Solar Monitoring Station at Kanyakumari.

Coastal Wind Studies

In order to obtain long-term data at about 100/200m (30m height) from the coast line, wind monitoring masts had been established on wave breakers only Kerala coast at Vizhinjam and Neendakara. It was proposed to re-commission these masts using C-WET wind measurement system. This data will help in establishing the near shore wind environment with better quality data. The commissioning of the stations will be in the first half of next year.

WIND TURBINE TESTING

Development of Wind Turbine Test Station

Over a period of four years, C-WET has developed its own full-fledged Wind Turbine Test Station (WTTS) 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 :

- Availability of two test beds to test wind turbines upto 1250kW capacity and 400kW capacity and the capacity expandable based on future offers.
- Readily available grid connection for each test bed.
- Readily available reference metmasts in front of each test bed with facility to modify the height of the masts to match the hub height of the test turbine.
- Availability of sophisticated PC based data logging systems at the control rooms of each test bed.
- Establishment of office-cum-workshop building at WTTS with facilities of a laboratory for data analysis and verification of functionality of the sensors/instruments and a workshop with adequate space to accommodate one nacelle for instrumentation purpose.

Provisional Type Testing

During the wind season of the year 2003, the testing unit of C-WET continued its provisional type testing programme on two wind turbines, one of 1250kW of M/s Suzlon Energy Ltd. and other of

250kW of M/s. TTG Industries at the Wind Turbine Test Station. Test and measurements were completed before the end of wind season and reports were presented to the clients.



Provisional Type Testing of TTG 250 kW wind turbine at WTTS.

C-WET has received requests from four clients for Provisional Type Testing and Certification of their wind turbines during the wind season of the year 2004. Discussion on Technical and Commercial aspects was completed with the respective clients. Two of the clients have requested C-WET to carryout the Provisional Type Testing and Certification at their sites. This has been agreed as per TAPS – 2000 and preparatory works have been initiated.

In-situ Power Performance

The testing unit of C-WET received request for in-situ power performance measurement on two wind turbines, one of 1000kW of M/s Suzlon Energy Ltd.

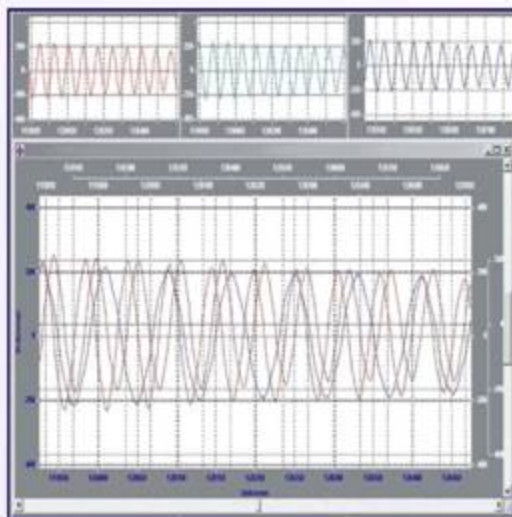
at Jaisalmer in Rajasthan and the other of 230kW of M/s. Enercon India Ltd. at Kapatguddah Hills in Karnataka. Measurements were carried out during the wind season of the year 2003. Reports were presented to the clients.



Power performance measurement on 230 kW Enercon wind turbine at Kapatguddah Hills.

Power Quality Measurements

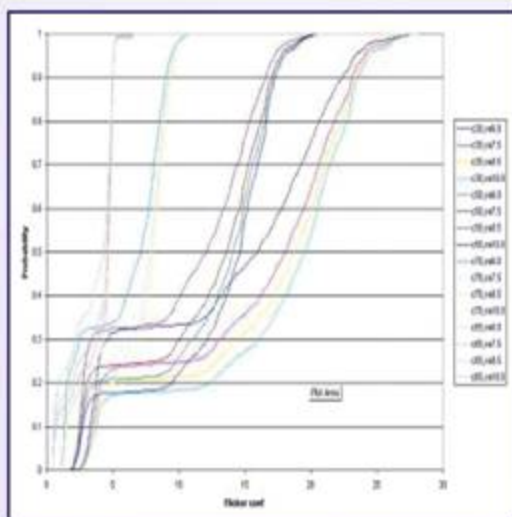
Power quality measurements were performed on a 410kW Kinetec wind turbine, which is a variable speed machine. Data collected was utilised for analysis and information inferred from the exercise has helped improve the institutes capability.



3-phase voltages measured on a variable speed wind turbine.



Verification of instrumentation on Suzlon 1000 kW wind turbine at Jaisalmer.



Flicker co-efficient.



Overview of Test and Measurements carried out

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)	500 kW, 39 m rotor diameter of VESTAS make
2002/2003	Provisional Type Test at WTTS	1250 kW, 64 m rotor diameter of SUZLON make
2002/2003	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 (Kapatguddah Hills, Karnataka)	230 kW, 30 m rotor diameter of ENERCON make

Progress towards National and International Accreditation

➤ As a part of efforts to get International Accreditation, the testing unit had prepared procedures on "Testing". Internal Audits were arranged for testing unit at Chennai on 18th May 2003 & 12th June 2003 and at WTTS, Kayathar on 14th May 2003 & 11th June 2003. Based on the audit findings and requirement for the testing unit, 11 procedures were revised. In addition, preparation of other documents such as Work Instructions for all test and measurements, Formats, Measurement & Instruments Handbook, Site and Safety Manual for ISO accreditation was completed.

Shri S. Ramanathan and Shri Rajkumar of DNV, Chennai did pre-assessment audit at C-WET, Chennai & WTTS, Kayathar respectively.

- For Accreditation of WTTS by National Accreditation Board for Testing and Calibration Laboratories (NABL), cross-references were prepared for QMS Apex Manual, taking into account the conditions and stipulations given in ISO 17025.
- C-WET initiated effort for enrolment as a member of MEASNET, a Network of European Measuring Institutes, for power performance measurement.

STANDARDS AND CERTIFICATION

Product Certification of Wind Turbines, evaluating the structural integrity and safety is becoming more and more relevant in India with the manufacturing industry coming forward to avail the services. Step by step, as new models or significant modifications are being introduced by the industry, the importance and value addition of certification is realized.

TAPS-2000 implemented from May 2000 has been amended to cater to the needs of the industry and to make it more user-friendly.

Certification Scheme, TAPS-2000 prepared based in line with the international scheme captured the good aspects from other country schemes. The special requirements with regard to grid and environmental conditions have been incorporated in TAPS-2000. Certification schemes and types certificates of other countries are accepted in India.

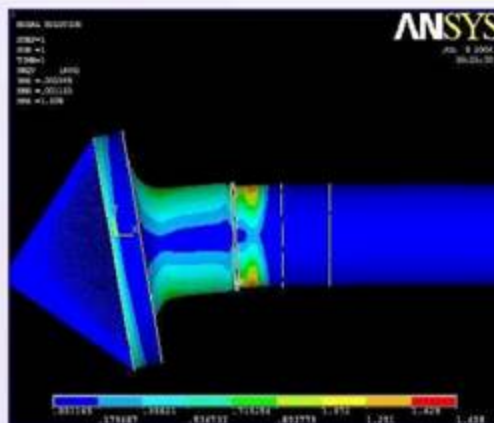
C-WET certification with seven certification projects on hand under all the three categories is striving to serve the industry better.



Meeting of Resident Experts, S&C Engineers and Engineers of Shanti Gears, regarding Gear Box manufacturing at Shanti Gears, Coimbatore.

Country specific Wind Turbine Certification Schemes are in the process of harmonization initiated by International Electrotechnical Commission (IEC) with a unified approach to facilitate international trade and mutual recognition. IEC, bring out standards for wind turbines issued a standard for certification. Indian

Application of advanced scientific or engineering models like Finite Element Analysis (FEA) for complex engineering calculations provide useful insights for certification. During the year, the focus was on completion of the knowledge transfer by Technical Consultants (TCs). As part of this, training on FEA was imparted. This was applied to one of the wind turbine components and the stress output used for evaluation and analysis is as shown in the figure.



**STATUS OF S&C PROJECTS****Provisional Type Certification – Status of Category-I Projects as on 31-03-2004**

S. No.	Project Name	Project Number	Manufacturer's Name	WT Model / Capacity	Status
1	NM 48/750 kW	PTC I 011	NEG Micon (India) Private Limited	NM 48/750 kW	On-going
2	C2920/250kW	PTC I 010	Chiranjeevi Wind Energy Limited	C2920/250kW	On-going
3	Pioneer Wincon W250/29	PTC I 008	Pioneer Wincon India Private Limited	W250/29	On-going

Provisional Type Certification – Status of Category-III Projects as on 31-03-2004

S. No.	Project Name	Project Number	Manufacturer's Name	WT Model / Capacity	Status
1	TTG 250 kW	PTC III 006	TTG Industries Limited	TTG-250 kW	On-going
2	Suzlon S64/66 – 1.25 MW	PTC III 007	Suzlon Energy Limited	S64/66 – 1.25 MW	Terminated

Provisional Type Certification – Renewal

S. No.	Project Name	Project Number	Manufacturer's Name	WT Model / Capacity	Validity
1	Enercon E30	PTC I-005-R1	Enercon (India) Limited	E30 – 230 kW	15-04-2004
2	Suzlon N3330/300 kW & N3335/350 kW	PTC II-002-R1	Suzlon Energy Limited	N3330/ 300 kW & N3335/ 350 kW	15-07-2004
3	Vestas V39/ 500 kW with 47 m rotor	PTC II-001-R2	Vestas RRB (India) Limited	V39/500	18-11-2004
4	NEPC-225 kW	PTC III-004-E	NEPC India Limited	225 kW	15-05-2004

List of Wind Turbine Manufacturers / Wind Electric Equipment

- The Committee meeting on the List of Manufacturers of Wind Electric Generators / Wind Turbine Equipment have been held periodically to verify the documentation provided by the manufacturers and to

recommend the list of Wind Turbine Manufacturers / Wind Electric Equipment for the issue.

- Four quarterly lists of Wind Turbine Manufacturers / Wind Electric Equipment have been issued.

**Type Approval Provisional Scheme**

Amendments to Type Approval Provisional Scheme (TAPS-2000) have been prepared and approval obtained from MNES. The amended TAPS-2000 is the Scheme for certification of WTs in India.

Type Approval Scheme

The draft Type Approval Scheme (TAS), prepared in association with RISO, has been submitted to MNES for approval. Detailed discussions were held with all the stakeholders of the wind energy sector seeking inputs for TAS.

National Application Documents

In an effort towards standards, three National Application Documents (NADs), to be used in association with IEC standards have been prepared in association with RISO. Draft NADs have been discussed with stakeholders of wind energy sector. The NADs have been submitted to MNES for further forwarding to BIS.

S. No.	IEC Standards	NADs
1	IEC WT 01: IEC System for Conformity Testing and Certification of Wind Turbines	NAD (IN) IEC WT 01
2	IEC 61400-1: Wind Turbines – Part 1: Safety Requirements	NAD (IN) IEC 61400-1
3	IEC 61400-12: Wind Turbines – Part 12: Wind Turbine Power Performance Testing	NAD (IN) IEC 61400-12

Preparation Accreditation

The Centre has been preparing for accreditation of the certification unit and the test laboratory. The action plan has been prepared as guide based on ISO: IEC Guide 65 and ISO: IEC Guide 17025.

QMS: ISO 9001- 2000

- The quality manual, common system procedures and few procedures of each unit were issued for implementation. In continuation of this, the preparation of Procedures/ Work Instructions / Formats have been taken up and completed.
- C-WET engineers were trained for conducting internal audit. Two internal audits and one management review meeting have been conducted.
- The pre-assessment audit has been conducted by DNV for both Testing and S&C units on 18-12-2003, for WRA unit on 05-01-2004 and for WTTS, Kayathar on 05-02-2004.
- Unit Chief / MR responsible for quality system development has become the Qualified Lead Auditor, through participation in the Lead Auditor Training Course, conducted during 28th April to 2nd May 2003, by the Institute of Quality, Confederation of Indian Industries, Bangalore.

Institutional Development

The Institutional Development Plan of S&C Unit prepared by the Institutional Development Consultant, appointed by DANIDA, has been discussed in detail. The draft report has been reviewed and necessary inputs were provided.



Mission of Resident Experts

Mr. Erik Joergensen and Mr. Carsten Skamris,



Certification Engineers discussing with Resident Expert

Resident Expert, RISO, Denmark worked with certification unit from 15-06-2003 to 14-9-2003 and 08-09-2003 to 6-12-2003 respectively. During the period, the preparation of TAS, NADs and review of QMS and other training aspects have been completed.

Important Meetings and Visits

S&C unit together with Resident Experts visited, discussed various certification related issues with

- (a) Shanti Gears manufacturing facility at Coimbatore on September 13, 2003.
- (b) LM Glassfibre India Limited, Bangalore on November 13, 2003.



INFORMATION, TRAINING AND COMMERCIAL SERVICES

Academic

The R&D Council for Centre for Wind Energy Technology took a decision to prepare a syllabus for the Master's level courses in Wind Energy in view of a need for such a course in the Universities and Engineering Colleges to provide adequately qualified manpower to the expanding industry. Accordingly, a syllabus committee was constituted with experts from academia and industry under the Chairmanship of Prof. Sujay Basu, Director, School of Energy Studies, Jadavpur University, Kolkata. This committee met thrice and finalized the syllabus for all of the subjects and electives for a two year Master's Degree course. The prepared syllabus has been forwarded to the MNES for consideration and approval and then the same would be duly forwarded to the AICTE for implementation in some of the universities. This course will help the Wind Industry, Utilities etc. to get proper qualified manpower.

International Training

The Centre for Wind Energy Technology had successfully organized an international training course on "Wind Turbine Technology and Applications" during 9-20 February, 2004 sponsored by the Ministry of Non-Conventional Energy Sources, Government of India. It was designed to help the countries in the region of Asia and Africa in wind farm development. 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 experiences from the lessons learnt over the last two decades. 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.



Second meeting of Syllabus Committee held on 4th July 2003 at C-WET, Chennai.



Participants at Wind turbine manufacturing plant.

The training programme was inaugurated by Shri Ajit K Gupta, Adviser, MNES and the keynote address was delivered by Dr. A. Raza, Director MNES. Eminent speakers from the wind energy sector conducted grueling, yet enlightening sessions covering the entire gamut of wind energy technology.

Apart from theoretical concepts, visits to manufacturing facilities were organized during the course to give a complete picture of the know-how and process to go about setting up a co-ordinated wind energy programme at a national level.



Country presentation by Mr. Fan Xiaoming, China in progress.

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.

Dr. K. K. Singh, Adviser, MNES has chaired the valedictory function and distributed the certificate to the participants.



Dr. K. K. Singh, Adviser, MNES at valedictory function.

Issues addressed by the training programme :

- Wind resources: physics and estimation.
- Wind turbine technology and grid integration.
- Wind turbine testing.
- Standards and Certification.
- Wind diesel hybrid systems.
- Implementation of wind power projects.
- Planning including design of wind farms.
- Installation and commissioning.
- Post-installation activities including O&M.
- Financing opportunities.
- CER related issues via-a-vis wind turbine technology.
- Cost benefit analysis of wind energy projects.



Participants at field visit – Jogimatti, Karnataka.

➤ Field visits to:

- Wind turbine manufacturing plants.
- Wind turbine testing station and wind farms.
- Wind turbine blade manufacturing facility.

National Training

C-WET successfully organised two short-term courses to the wind farm operators and technicians in collaboration with Indian Wind Power Association, Chennai at Coimbatore on 07th & 08th November 2003 and at Tirunelveli on 5th & 6th December 2003 in Tamil Nadu.



Training course at Coimbatore on 7th November 2003.

The C-WET officials: Dr. E. Sreevalsan, Scientist and Shri R. Sasi Kumar, Meteorologist delivered well-received lectures on Wind Climatology, site selection and measurements, micro-survey in the region of interest and micro-siting and layout of wind farm. As part of the training course, field visit to wind farm in the nearby area was also arranged. In fact the participants for the course were overwhelmed than what we expected and the reason being the participation of C-WET.

In this programme, the activities of C-WET were disseminated. Some of the participants have approached C-WET for assistance in Micrositing.



Wind farm visit at Edayarpalayam on 8th Nov. 2003.

Newsletter

A quarterly newsletter, 'PAVAN' is planned to be published for creating awareness and disseminating information of the activities and role of the Centre as well as local and global developments in the wind energy sector. The newsletter is intended to be a forum for the wind energy industry in general and C-WET in particular. The aim of the newsletter is to create a forum / platform for exchange of ideas and views related to wind energy amongst the policy makers, project promoters, suppliers, financiers, and technologists.

The tentative content of the magazine could include the following sections 'news section', 'happenings at C-WET', 'policy', 'technology', 'data & achievements', an 'interview', and 'new products'.

The proposed number of pages would be about 8 and 250 copies. The newsletter is ready to print and would be circulated soon.



National Technology Day Celebration

To demonstrate the commitment to Science & Technology, C-WET has been celebrating the National Technology Day from the year 2001. During the first two years, C-WET celebrated the National Technology Day at Chennai by inviting the experts in wind energy and disseminating the research programmes of C-WET. During the year 2003, C-WET decided to celebrate this occasion at its Wind Turbine Test Station, Kayathar, with school students invited from the neighbouring villages. Accordingly, a modest programme was arranged on 11th May 2003. About 30 students and teaching staff members from three different schools in and around Kayathar, local technicians and C-WET staff participated in the programme. C-WET officials explained the importance of the day, activities of C-WET and WTTS, basic wind turbine technology and about clean environment. A quiz programme was also organised for the school children. Apart from theoretical explanations all participants were taken to the visit to solar power plant and wind farms.



Participants of the National Technology Day celebration at WTTS, Kayathar.

Hindi Day Celebration

"Hindi Diwas" celebrated on 16-09-2003 at Conference Hall of Centre for Wind Energy Technology at 15.00 hours. Shri M. P. Ramesh, Executive Director and Chairman of Hindi Promotion Committee, C-WET invited the Chief Guest and employees of C-WET. Shri K. C. Dhimole, Unit Chief, WRA and Member-Secretary of Hindi Promotion Committee, C-WET presented a detailed report on implementation of Hindi in C-WET. He readout the message of the Honourable Minister and requested all the employees to take more active participation to promote Hindi in C-WET. The Chief Guest, Shri M. P. Dubey, Deputy Director (South), Hindi Teaching Scheme, Ministry of Home Affairs, delivered the Keynote address regarding implementation of Hindi as official language, highlighting how Parliament approved Hindi as official language and Constitutional provisions under Article 343, 351 etc., for promotion of Hindi. The C-WET employees participated and delivered speech in Hindi on the topic "Role of C-WET in Wind Power Development". Essay writing competition was also conducted on the topic "Treating Salt Water for Drinking Purpose" and the Chief Guest distributed the prizes to the successful participants. The meeting concluded with a Vote of Thanks by Shri K. V. Uma Maheswara Rao, A & A.O., Member of Hindi Committee, C-WET.

Networking Facility

The works are in progress for establishing Local Area Network (LAN) facility for C-WET new

campus at Pallikaranai to have the Internet connectivity to speed up the Information Dissemination. The work of establishing better LAN facility is assigned to the National Informatics Centre Services Incorporated (NICSI), Chennai and the work in respect of getting a better Internet leased line connectivity of 128Kbps is in progress. We are also in the process of buying servers for hosting the Centre's website and distributing the official e-mail facility for the employees.

Lecture Hall facility

The works are moving forward to establish a well-equipped modern Lecture Hall with sophisticated audio-visual systems with the capacity of accommodating hundred people.

Library Activities

The C-WET Library was taken care by the R&D unit and now it has been handed over to the ITCS unit. The works are in progress in establishing well-equipped Library with increased strength of literary resources.

Apprentice Programme

Five apprentices, two graduates and three diploma holders have been engaged in different units for a period of one year to provide an opportunity to learn and gain experience about wind energy technologies :

1. Mr. R. Machlin Allen
2. Mr. R. Uthra Pandian
3. Mr. M. A. Balaji
4. Mr. M. Arun
5. Mr. K. Vinoth Kumar

State Nodal Agency meet

A meeting was organised at Chennai on 25th August 2003 to finalise the implementation strategy of the programme Wind Resource Assessment in Uncovered / New areas sanctioned by the Non-Conventional Energy Sources in eleven states. Modus operandi and schedule for establishing twenty stations with 50m tall height masts with multi level instrumentation, selection of sites, responsibilities of the SNAs and C-WET, operation of running wind monitoring stations were deliberated in the meeting. Representatives of the respective Nodal Agencies and officials from MNES and C-WET participated in the deliberation. An interim report (No.23) containing data (one year) from 37 wind-monitoring stations from seven states have also been released during the meeting.



Discussion on site selection with State Nodal Agencies' representative.

Conferences, Meeting and Training Attended by C-WET Staff

Research & Development

1. Shri K. Boopathy, Scientist, "Wind Energy Conversion Systems", IIT, Mumbai, 21-22 April 2003.
2. Shri S. Sureshbabu, Technician, Certificate course on "Applications of MATLAB, PSPICE



& PSCAD simulation tools for Electrical and Electronics Engineering”, Vellore Institute of Technology, Vellore, 19th - 30th May 2003.

3. Shri K. Boopathy, Scientist, the Technology Appreciation Programme on “Failure Analysis –Principles and Application”, IIT, Chennai.
4. Shri K. Boopathy, Scientist, the Training Programme on “Benchmarking and Road Mapping of Renewable Energy Technology in India”, organized by Winrock International India, New Delhi, 03rd - 13th October 2003.

Wind Resource Assessment

1. Shri R.Sasikumar, Meteorologist, Training course on introduction to GIS as its application, NRSA, Hyderabad, 31-08-2003 to 26-09-2003.

Wind Turbine Testing

1. The Technical Consultants from Riso National Laboratory visited C-WET, Chennai & WTTS, Kayathar three times. The mission was to impart training to the testing unit team on Power Quality Measurements and load measurements and analyse the data.
2. The TC from RISO, Mr. Uwe Paulsen visited C-WET, Chennai and WTTS, Kayathar during the month of June 2003 (from 16th June to 29th June, 2003) for supervision of the measurement on both test turbines and QMS programme for ISO accreditation.
3. The TC from RISO, Mr. Poul Soresen visited C-WET, Chennai and WTTS, Kayathar during the months of July - August 2003 (from 23rd July to 13th August, 2003) and imparted training on the handling and use of the power quality

measurement equipment and for measurement of power quality parameters of the wind turbine.

4. The TC from RISO, Mr. Uwe Paulsen visited C-WET, Chennai during 17th - 29th November 2003 and imparted training on QMS implementation and documentation work, Mr. Uwe reviewed the yaw efficiency draft report, power performance report and safety & functional report. Load measurement draft report under progress.

Standard & Certification

1. Scientists / Engineers of S&C unit were deputed to attend the conference on ANSYS held on 12-11-2003 at Bangalore.
2. Mr. Erik Joergensen and Mr. Carsten Skamris, Resident Expert, RISO, Denmark provided the training from 15-06-2003 to 14-09-2003 and 08-09-2003 to 06-12-2003 respectively. During the training period, the preparation of TAS, NADs and review of QMS and other training aspects have been completed.
3. The unit has actively participated in organising and delivering lectures in the training programme. As part of the training programme a visit to LM Glasfiber and wind farms in and around Chitradurga have been made. A test for the benefit of the participants was carried.
4. The training on ANSYS was provided to S&C, Testing and R&D unit Scientists / Engineers, during 13-15th October 2003.

Information, Training and Commercial Services

1. Shri P. Kanagavel, Scientist, “Wind Energy Conversion Systems”, IIT, Bombay, 21-22 April 2003.



2. Shri P. Kanagavel, Scientist, the Training Programme on "Benchmarking and Road Mapping of Renewable Energy Technology in India", organized by Winrock International India, New Delhi, 03rd - 13th October 2003.

Administration

1. Ms. K. Tamilselvi, Office Assistant, the one day workshop on TDS, Central Sales Tax and Service Tax, organized by the Southern India Regional Council of Institute of Costs and Works Accountants of India, Chennai, 25-07-2003.
2. Shri R. Girirajan, Office Assistant, a half a day workshop on Recent Changes in Central Excise and Customs, organized by the Southern India Regional Council of Institute of Costs and Works Accountants of India, Chennai, 21-08-2003.
3. Shri T. Nagesha Rao, General Manager (F&A), 3 days All-India Residential Programme on Reservation Policy for Liaison Officers for SCs / STs / OBCs, organized by National Institute of Public Administration, Bangalore, 27th - 29th November 2003.
4. Shri M. P. Ramesh, Executive Director, 17th National Conference on In-house R&D in Industry organized by the Department of Science and Technology in association with the Federation of Indian Chambers of Commerce and Industry (FICCI), New Delhi, 10-11 November 2003.
5. Shri K. V. Uma Maheswara Rao, Admn. & Accts. Officer, 2 days All India Conference on the Contract Labour (Regulation & Abolition) Act, 1970, organized by National Institute of Public Administration at Bangalore, from 05th - 06th December 2003.
6. Shri M. P. Ramesh, Executive Director, the two day MNES Annual Conference, 09th - 10th May 2003.
7. Shri M. P. Ramesh, Executive Director, the one day Business Meet on "Opportunities for Investment in Wind Mills in other potential areas", organised by Tamilnadu Energy Development Agency at Madurai, 28-02-2004.
8. Shri M. P. Ramesh, Executive Director, the first meeting of the Committee constituted by Indian Renewable Energy Development Agency Limited, New Delhi to review the cost of projects for various renewable energy sector projects, 19th March 2004.
9. Shri M. P. Ramesh, Executive Director, writing the revised Best Practices Guidelines to be issued by the Ministry under overall guidance of the Secretary, MNES, New Delhi.

Selected Lectures in Conference and Seminars

1. Shri R. Sasikumar, "Wind Climatology", training programme for Wind Farm Technicians and Operators, Coimbatore, organized by IWPA and C-WET, 07-11-2003.
2. Shri R. Sasikumar, "Wind Climatology", training programme for Wind Farm Managers, Tirunelveli, organized by IWPA and C-WET, 05-12-2003.



CENTRE FOR WIND ENERGY TECHNOLOGY

3. Shri R. Sasikumar, "Wind Measurement and Instrumentation", the international training programme on Wind Turbine Technology and Applications, organized by C-WET, Chennai, 9th-20th February 2004.
4. Shri M. P. Ramesh, Executive Director, "Wind Resources and Technologies", one day workshop "5000 MW of Wind Power by 2007 Why not?", organized by Indian Wind Energy Association (IWEA), New Delhi, 27-06-2003.
5. Shri M. P. Ramesh, Executive Director, the Founding Day Lecture on "Resource Assessment as a key input into Renewable Energy Development" during the MEDA Founding Day Celebration, MEDA, Pune, 26-07-2003.
6. Shri M. P. Ramesh, Executive Director, "Wind Energy and its Utilisation", the Short Term Training Programme on Energy Prospects for Future - Global Perspective, organized by Sri Chandrasekharendra Saraswathi Viswa Mahavidyalaya (Deemed University), Kancheepuram, 15th December 2003.
7. Shri M. P. Ramesh, Executive Director, "Wind Resources Modeling Techniques"; "Micro-siting and layout of wind farms"; "Offshore Wind Energy Developments", the First International Training Course organized by C-WET, Chennai, 9th - 20th February 2004.
8. Shri M. P. Ramesh, Executive Director, "Assessment of Wind Energy Projects - Idea to Implementation", the Green Power 2003 International Conference-cum-Exposition on Green Power, Chennai, organized by Confederation of Indian Industry - Sohrabji Godrej Green Business Centre, on 19-06-2003.
9. Dr. E. Sreevalsan, "Micro Survey on Wind in the Region of Interest", training programme for Wind Farm Technicians and Operators, Coimbatore, 07-11-2003 and Tirunelveli, 5-12-2003 organized by IWPA and C-WET.
10. Dr. E. Sreevalsan, "Micro siting & Layout of Wind Farms", training programme for Wind Farm Managers, 7-11-2003 at Coimbatore and 5-12-2003 at Tirunelveli organized by IWPA and C-WET.
11. Dr. E. Sreevalsan, "Wind Power Statistics and Energy Calculations", the international training programme on Wind Turbine Technology and Applications, Chennai organized by C-WET, 10-02-2004.
12. Dr. E. Sreevalsan, "Wind Resource Assessment over Indian Coast for Wind Power Development", the International Conference on Coastal and Ocean Technology, NIOT, Chennai, 11-12-2003.
13. Dr. E. Sreevalsan, "Siting Techniques for Wind Farms" at Department of Physics, Cochin University of Science & Technology, Cochin, 20th June, 2003.
14. Dr. E. Sreevalsan, "Wind Power Development in India", the Energy on Seminar on week, Vellore Institute of Technology, Vellore, 11th March 2004.



15. Shri N. S. Prasad, UC, S&C, "Certifications on Wind Turbines", "Business Meet on Wind Energy Investments in Karnataka", organised by INWEA, IREDA and KREDL, Bangalore.
16. Shri N. S. Prasad, "Prospects of Eco-friendly Wind Energy Technology", "4 day Southern Regional Training Programme on Renewable Energy Technologies for Pollution Control Boards", Periyar Maniammai College of Technology for Women, Vallam, Thanjavur.
17. Shri A. Senthil Kumar, Scientist "B", S&C, "Overview of Wind Energy" by at "Interactive Meet on Energy Conservation Options", organized by IREDA and Jaya Engineering College, Chennai.

Publications

1. Shri N. S. Prasad, "Testing & Certification of Wind Turbines – The Need of the Hour", Directory Indian Wind Power 2003, published by Consolidated Energy Consultants Limited, Bhopal.
2. Shri N. S. Prasad & M. P. Ramesh, "Wind Turbine Certification Systems – National and International", SESI journal.
3. Shri R. Sasikumar, "Wind Resource Assessment over Indian Coast for Wind Power Development", proceedings of the International Conference on Coastal and Ocean Technology, NIOT, Chennai, 10th–12th December 2003.

Visits Abroad

1. Shri M. P. Ramesh, Executive Director and Shri S. A. Mathew, Scientist, Testing attended 21st International Meeting on Test Stations at Gotland, Sweden from 21-09-2003 to 27-09-2003. Presented technical paper title "Power Performance Testing (IEC 61400 – 12) – Case Studies in Site calibration in homogeneous terrains". Shri M. P. Ramesh, Executive Director discussed with Germanischer Lloyds, Germany, Managing Director, GL and made presentation on the overall activities of C-WET on 29th September 2003. Initiated discussion for collaborative work.

Important Meetings

1. Three draft standards in the form of NADs prepared by C-WET were discussed on October 28, 2003 with all the stakeholders of the wind energy sector. Inputs obtained from the sector were incorporated in the three NADs and forwarded to MNES.
2. A meeting with all the stakeholders of the wind energy sector regarding Type Approval Scheme was conducted on November 25, 2003. Detailed discussions were held to seek inputs of the sector towards Type Approval System.
3. An expert committee meeting was held under the chairmanship of Dr. Kota Harinarayana, Vice-Chancellor, Hyderabad University with Prof. S. P. Govindaraju, IISC. Bangalore, Shri J. P. L. N. Sastry, Member R&D Council as members and Shri M. P. Ramesh, Executive



- Director, C-WET as Member Secretary to review the proposal on “Development and validation of design methodologies and design tools for low and moderate wind regimes” on 2nd May 2003.
4. The Seventh Meeting of the R&D Council was held on 12th September 2003 at National Aerospace Laboratories, Bangalore.
 5. A Meeting of R&D Sectoral Panel on Power Generation (Wind and Biomass) with stakeholders was organised on 06-10-2003 by Ministry of Non-Conventional Energy Sources to consider and obtain views of various stakeholders with regard to R&D in Wind Power.
 6. A Meeting on “Study on Penetration of Wind Power Projects and their impact on the existing Grids” was organised on 07-10-2003 by C-WET on behalf of Ministry of Non-Conventional Energy Sources to finalize the scope of work / Terms of Reference for the aforesaid study.
 7. Contact group meeting: An expert group from wind energy sector has been constituted by the Executive Director, C-WET as Contact Group with an aim to discuss burning topics of the sector. The first meeting of the group held on January 22, 2004 and discussed the blade development and manufactured.



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. Secretary, MNES
2. Financial Adviser, MNES
3. Adviser & Head, Power Group, MNES
4. Secretary (Energy), Tamil Nadu Government
5. Director General, Bureau of Indian Standards
6. Chairman, Central Electricity Authority
7. Managing Director, IREDA
8. Dr. B. Ramchandra Pai, Director, NAL, Bangalore
9. Dr. V. Siddhartha, Outstanding Scientist, Scientist 'H', Secretariat of SA to RM, New Delhi
10. Mr. Rajan T. Joseph, Executive Director, Centre for Development of Advanced Computer (formerly ER & DCI), Thiruvananthapuram
11. Chairman, Indian Wind Turbine Manufacturers Association, Chennai
12. Executive Director, C-WET

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. Joint Secretary & 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. Financial Adviser, MNES
2. Secretary (Energy), Tamil Nadu Government
3. Adviser & Head, Power Group, MNES
4. Director, Wind Power, MNES
5. General Manager (F&A), C-WET



Building and Infrastructure Development Committee

The following are the members of the Building and Infrastructure Development Committee (To consider, finalize and recommend master plan for new campus of Centre at Pallikaranai):

1. Mr. K. S. Narayanan, Chief Engineer (Retd.), CPWD
2. Mr. Anant Raje, Consultant Architect
3. Mr. K. Veeraraghavan, Chief Engineer (Retd.), State PWD
4. Mr. M. Santhanam, Chief Architect (Retd.), State PWD
5. Mr. N. Rajagopalan, Professor (Retd.), IIT, Chennai
6. Mr. S. Gopal, Superintending Engineer (Retd.), CPWD
7. Executive Director, HUDCO - South Zone, Chennai
8. Director, Solar Energy, MNES
9. Director, Wind Power, MNES
10. Executive Director, C-WET
11. Principal Engineer, WRA, C-WET
12. General Manager (F&A), C-WET

Steering Committee

The following are the members of the Steering Committee (To formulate broad policies, plans and approve the budget for the functioning of the Wind Turbine Test Station within the overall framework of the Centre for Wind Energy Technology):

1. Secretary, MNES
2. Chairman & Managing Director, TEDA
3. Representative of DANIDA
4. Danish Technical Consultant for the Project
5. Danish Project Monitoring Consultant for the Project
6. Managing Director, IREDA
7. Dy. Director General, Bureau of Indian Standards
8. Chairman, Indian Wind Turbine Manufacturers Association
9. Prof. Sujay Basu, Jadavpur University, Kolkata
10. Hon. Secretary, WINDPRO, Chennai
11. Financial Adviser, MNES
12. Adviser & Head, Power Group, MNES
13. Project / Executive Director, C-WET



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

List of Manufacturers Committee

The following are the members of the List of Manufacturers Committee (To prepare and finalize the list of manufacturers):

1. Mr. V.V. Shantaraman, Secretary, IWTMA
2. Mr. P.T. Kumar, Joint Director, BIS, Southern Regional Office, Chennai
3. 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, Outstanding Scientist & Scientist 'H', Ministry of Defence (Chairman, R&D Council), Secretariat of SA to RM, New Delhi
2. Mr. Ajit K. Gupta, Adviser, Power Group, MNES, New Delhi
3. Ms. K. A. Fathima, Additional Director & Head, Power Electronic Groups, ER & DCI, Trivandrum
4. Dr. A. Rama Mohan Rao, Scientist Gr. IV(4), Structural Engineering Research Centre, Chennai
5. Dr. Vidyadhar Mudkavi, Scientist, Computational and Theoretical Fluid Dynamics Division, National Aerospace Laboratories, Bangalore
6. Shri L. E. D'Cruz, Adviser, Enercon (India) Limited, Andheri (West), Mumbai
7. Dr. G. B. Pant, Director, Indian Institute of Tropical Meteorology, Pune
8. Prof. Sujay Basu, Director, School of Energy Studies, Jadavpur University, Kolkata
9. Shri J. P. L. N. Sastry, Ex. G. M. & Head, R&D, BHEL and Ex. OSD of C-WET, Hyderabad
10. Shri M. P. Ramesh (Member-Secretary), Director and Unit Chief, R&D, C-WET, Chennai.



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
2. Mr. M. P. Ramesh, Executive Director, Centre for Wind Energy Technology, Chennai
3. Dr. N. Siva Prasad, Professor, Machine Design Section, Dept. of Mech. Engineering, IIT, Chennai
4. Dr. Bh. Nagabhushana Rao, Professor, Structural Engineering Division, Anna University, Chennai
5. Dr. C. Chellamuthu, Professor & HOD, Electronics & Communication Engineering and Dean, R&D and Consultancy, Jeruselam College of Engineering, Chennai
6. Dr. R. Rudramoorthy, Professor, Mechanical Sciences, PSG College of Technology, Coimbatore
7. Mr. Sarvesh Kumar, Chairman, IWTMA, Chennai
8. Dr. K. K. Sasi, Reader, Department of Energy, Tezpur University, Tezpur, Sonitpur, Assam
9. Mr. K. C. Dhimole, Principal Engineer & Head, WRA & ITCS, C-WET, Chennai

Changes in the C-WET family

1. Shri. Haji Abdul Ibrahim joined as Attendant on 18th August 2003.
2. Shri. Rajesh Katyal joined as Scientist 'D' on 27th November 2003.
3. Shri. K. C. Dhimole, Scientist 'D' relieved from the services of C-WET on 30th November 2003 on completion of his tenure of deputation.

New Facilities

C-WET started functioning in its new campus at Survey No. 657/1A2, Velachery - Tambaram High Road, Pallikaranai, Chennai - 601 302 with effect from 22-03-2004.





HUMAN RESOURCE

(M. P. Ramesh, Executive Director)

Research & Development

K. Boopathi, Scientist 'B'
Deepa Kurup, Junior Engineer
S. Suresh Babu, Technician
M. R. Gunasekaran, Steno

Wind Resource Assessment

K. C. Dhimole, Scientist 'D'
E. Sreevalsan, Scientist 'C'
R. Sasikumar, Meteorologist
T. Arivukkodi, Technician
K. A. Haji Abdul Ibrahim, Attendant

Wind Turbine Testing

K. J. Sundararamoorthy,
Officer on Special Duty
V. Asaithambi, Scientist 'C'
M. Anvar Ali, Scientist 'B'
S. A. Mathew, Scientist 'B'
J. C. David Solomon, Scientist 'B'
R. Kumaravel, Junior Engineer
M. Karuppuchamy, Technician
A. R. Hasan Ali, Technician
Y. Packiyaraj, Technician

Standards and Certification

N. S. Prasad, Scientist 'F'
Rajesh Katyal, Scientist 'C'
A. Senthil Kumar, Scientist 'B'
V. R. Gireesh Kumar, Scientist 'B'
S. Sivakumar, Junior Engineer
S. Arulselvan, Technician

Information, Training and Commercial Services

P. Kanagavel, Scientist 'B'

Administration

T. Nagesha Rao, General Manager (F&A)
K. V. Uma Maheswara Rao,
Admin & Account Officer
M. Sundaramoorthy, Officer (Stores & Purchase)
R. Girirajan, Office Assistant
R. Vijayalakshmi, Office Assistant
K. Tamilselvi, Office Assistant
B. Muthulakshmi, Steno
M. Selvakumar, Attendant



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

M. P. Ramesh

1. Consultative Group on Wind Power, constituted by the Ministry to review and consolidate the Guidelines for wind power projects, Member.
2. Group of Experts (GE) on Engineering and Communication, constituted by the National Centre for Antarctic and Ocean Research (Department of Ocean Development), Goa, Chairman.
3. Technical Committee constituted by Central Board of Irrigation and Power, New Delhi to scrutinize the papers of the First International Conference on "Renewable Energy", Member.
4. Wind Energy Sector – A Committee constituted by Indian Renewable Energy Development Agency Limited, New Delhi to review the cost of projects for various renewable energy sector projects, Member.
5. Aeronautical Society of India, Member.
6. International Solar Energy of Education (affiliated to ISES), Member.

K. C. Dhimole

1. Indian Society of Agricultural Engineers (ISAE), Member.
2. Indian Society for Technical Education, Member.
3. Indian Association of Soil and Water Conservationist, Member.
4. Institution of Engineers (India), Fellow.
5. Solar Energy Society of India, Member.
6. Council of Food & Agriculture Division, Bureau of Indian Standards, Member.
7. Asian Association for Agricultural Engineering (Thailand), Member.
8. Indian Water Resources Society, Member.

9. Governing Board of Editors (American Biographical Institute, USA), Member.
10. Indian Meteorological Society, Member.
11. Expert Committee on Wind Power Development Programme (Govt. of Kerala), Member.

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.
4. Lead Author of the TAR (WG III) of "Inter-Government Panel on Climate Change (IPCC)."

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.

V. Asaithambi

1. Institution of Engineers (India), Member.

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.



CENTRE FOR WIND ENERGY TECHNOLOGY

Founder (Late)
K. GNANANANDULU, G.D.A., F.C.A.

Managing Partner
K. NARASIMHAM, B.A., F.C.A.

Managers :
K. RAMAKRISHNA, B.Sc.
K. RAVISHANKAR, B.Sc., I.C.A.

K. Gnananandulu & Co.,
CHARTERED ACCOUNTANTS
280 / 682, MOUNT ROAD,
Chennai - 600 006.

Phone : 2852 5067
Res : 2434 2523
2434 1957

Residence :
50/21, Madley Road,
T.Nagar, Chennai - 600 017.

AUDITOR'S REPORT

To
The Governing Council,
Centre for Wind Energy Technology,
Survey No. 657/1A2,
Velachery - Tambaram High Road,
Pallikaranai, Chennai - 601 302.

We have audited the attached Balance Sheet of Centre for Wind Energy Technology as at 31st March 2004, Receipts and Payments Account and Income and Expenditure Account for the year ended as on that date along with Schedules, Significant Accounting Policies and Notes forming part of accounts are annexed thereto. These financial statements are the responsibility of the Centre for Wind Energy Technology (An Autonomous Institution of Government of India). 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 misstatement. An audit include 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 overall financial statement presentation. We believe that our audit provides a reasonable basis for our opinion.

As required by the Tamilnadu Societies Registration Act, 1975 and Tamilnadu Societies Registration Rules, 1978, we report that :



CENTRE FOR WIND ENERGY TECHNOLOGY

1. We have obtained all the information and explanation, which to the best of our knowledge and belief were necessary for the purpose of audit.
2. In our opinion, proper books of account as required by law have been kept by the Centre for Wind Energy Technology so far as it appears from our examination of those books.
3. The Balance Sheet, Receipts and Payments Account and Income and Expenditure Account dealt with by this Report are in agreement with the books of account. The accounts are prepared based on the Uniform Format of accounts for Central Autonomous Bodies.
4. In our opinion the Balance Sheet and Income and Expenditure Account dealt with by this Report comply with the accounting standards.
5. In our opinion and to the best of our information and according to the explanations given to us, the said accounts read together with the schedules, accounting policies and notes thereon give a true and fair view in conformity with the accounting principles and standards generally accepted in India:
 - (i) In the case of the Balance Sheet of the state of affairs of the Centre for Wind Energy Technology as at 31st March 2004.
 - and
 - (ii) In the case of the Income and Expenditure Account of the excess of Expenditure over Income of the Centre for Wind Energy Technology for the year ended on that date.

Place : Chennai
Date : 7-8-2004

for **K. GNANANANDULU & Co.,**
CHARTERED ACCOUNTANTS

K. Narasimham
Partner



CENTRE FOR WIND ENERGY TECHNOLOGY

BALANCE SHEET AS AT 31st MARCH 2004

(Amount in Rs.)

CAPITAL FUND AND LIABILITIES	Schedule	Current Year	Previous Year
CORPUS AND CAPITAL FUND	1	82,602,416	52,292,651
RESERVES AND SURPLUS	2	20,623,166	14,902,585
EARMARKED AND ENDOWMENT FUNDS	-	-	-
SECURED LOANS AND BORROWINGS	-	-	-
UNSECURED LOANS AND BORROWINGS	-	-	-
DEFERRED CREDIT LIABILITIES	-	-	-
CURRENT LIABILITIES AND PROVISIONS	3	10,873,892	7,330,976
TOTAL		114,099,274	74,526,211
ASSETS			
FIXED ASSETS	4	62,461,334	40,987,682
INVESTMENT - FROM EARMARKED AND ENDOWMENT FUNDS	-	-	-
INVESTMENT - OTHERS	-	-	-
CURRENT ASSETS, LOANS AND ADVANCES	5	51,637,940	33,538,529
MISCELLANEOUS EXPENDITURE (to the extent not written off or adjusted)	-	-	0
TOTAL	-	114,099,274	74,526,211
SIGNIFICANT ACCOUNTING POLICIES	13		
NOTES ON ACCOUNTS	14		

For Centre for Wind Energy Technology

As per our Report attached
for K. Gnananandulu & Co.,
Chartered Accountants

D. Lakshmanan
General Manager (F&A)

M.P. Ramesh
Executive Director

A. M. Gokhale
President / Chairman

K. NARASIMHAM
Partner



INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED 31st MARCH 2004

(Amount in Rs.)

INCOME	Schedule	Current Year	Previous Year
Income from Sales and Services	6	10,476,984	8,531,416
Income from publication	7	491,800	327,590
Interest Earned	8	1,267,899	532,059
Other Income	9	44,431	29,393
TOTAL (A)		12,281,114	9,420,458
EXPENDITURE			
Establishment Expenses	10	6,934,663	6,122,860
Other Administrative Expenses	11	6,635,712	6,433,742
Depreciation	4	3,913,416	3,928,106
TOTAL (B)		17,483,791	16,484,708
Balance being excess of Expenditure over Income (A - B)		5,202,677	7,064,251
Prior period adjustment	12	3,058	755
Transfer to General Reserve		4,386,956	2,182,466
Transfer to Corpus Fund			
BALANCE BEING DEFICIT CARRIED TO CAPITAL FUND		9,592,691	9,247,471
SIGNIFICANT ACCOUNTING POLICIES	13		
NOTES ON ACCOUNTS	14		

For Centre for Wind Energy Technology

As per our Report attached
for K. Gnananandulu & Co.,
Chartered Accountants

D. Lakshmanan
General Manager (F&A)

M.P. Ramesh
Executive Director

A. M. Gokhale
President / Chairman

K. NARASIMHAM
Partner



RECEIPTS AND PAYMENTS ACCOUNT
(Amount in Rs.)

RECEIPTS	Current Year	Previous Year
I. Opening Balances		
(a) Cash in hand		
(b) Bank balances		
i) In Current Account	7,289,264	2,912,054
ii) In Deposit Accounts	6,910,950	2,600,000
(c) Stamps on hand	11,665	1,202
II. Grants Received		
(a) From Government of India	41,000,000	41,571,449
(b) From Government of India for execution of Wind Resource Assessment Projects	8,300,000	2,000,000
(c) From Government of India for organising an international training programme	604,000	
III. Income on Investments		
IV. Interest Received		
(a) On Bank deposits	1,267,899	532,059
V. Other Income		
(a) Fees for services	4,867,825	5,739,855
(b) Income from publications	491,800	327,590
(c) Energy receipts	6,225,449	1,806,803
(d) Misc. income	79,631	29,393
VI. Amount borrowed		
VII. Any other receipts		
(a) Fees received in advance (Consultancy)	3,198,876	3,355,211
(b) Other advance		206,779
(c) Dues received from MNES		
(d) Security deposit	90,000	15,510
(e) Service Tax	479,975	335,897
TOTAL	80,817,334	61,433,802



CENTRE FOR WIND ENERGY TECHNOLOGY

FOR THE YEAR ENDED 31st MARCH, 2004

(Amount in Rs.)

PAYMENTS	Current Year	Previous Year
I. Expenses		
(a) Establishment Expenses - (Corresponding to Schedule-10)	6,499,351	5,747,758
(b) Administrative Expenses - (Corresponding to Schedule-11)	5,281,165	5,418,958
II. Payments made against funds for various projects		
Out of CFA		
(a) R&D project expenses	125,000	45,153
(b) Research support to WRA	599,435	
(c) HRD and manpower training	212,851	56,485
(d) Seminar & Information dissemination	26,661	98,029
(e) Advance for execution of projects	1,663,000	957,938
Out of Grants for projects		
(f) International training programme	673,423	
(g) Wind Energy Resource Survey Project	975,641	927,956
(h) North-Eastern Project	2,345,551	36,280
(i) Micro-survey & preparation of Master Plan	1,458,000	765,000
(j) Study on Uncovered / New areas	3,611,196	
III. Investment and Deposits made		
IV. Expenditure on Fixed assets & Capital Work-in-Progress		
(a) Purchase of Fixed assets	4,154,983	4,360,219
(b) Expenditure on Capital Work-in-progress	22,077,521	16,025,862
(c) Advance on capital account	6,181,987	11,281,537
V. Refund of Surplus Money		
(a) Balance of Grants-in-aid to Government of India		
VI. Other Payments		
(a) Refund of Security Deposits		15,510
(b) Expenditure on Consultancy Projects	1,561,887	1,033,632
(c) Advance & Deposits	-324,662	262,002
(d) Dues from MNES	-	-
(e) Prior period expenses	3,058	755
(f) Advance to sub-contract services		
(g) Advance to Group Gratuity Trust		
(h) Service tax remittances	529,154	188,849
VII. Closing Balances		
(a) Cash in hand		
(b) Bank Balances		
i) In Current Account	14,065,257	7,289,264
ii) In Deposit Accounts	9,093,416	6,910,950
(c) Stamps on hand	3,459	11,665
TOTAL	80,817,334	61,433,802

For Centre for Wind Energy Technology

As per our Report attached
for K. Gnananandulu & Co.,
Chartered AccountantsD. Lakshmanan
General Manager (F&A)M.P. Ramesh
Executive DirectorA. M. Gokhale
President / ChairmanK. NARASIMHAM
Partner



CENTRE FOR WIND ENERGY TECHNOLOGY

AUDITORS :

M/s. K. Gnananandulu & Co.
Chartered Accountants
682, Mount Road
Chennai - 600 006

BANKERS :

Canara Bank
Anna Nagar West Extension
Chennai - 600 101

Vijaya Bank
Anna Nagar
Chennai - 600 040

REGISTERED OFFICE :

Survey No. 657/1A2
Velachery - Tambaram High Road
Pallikaranai
Chennai - 601 302

