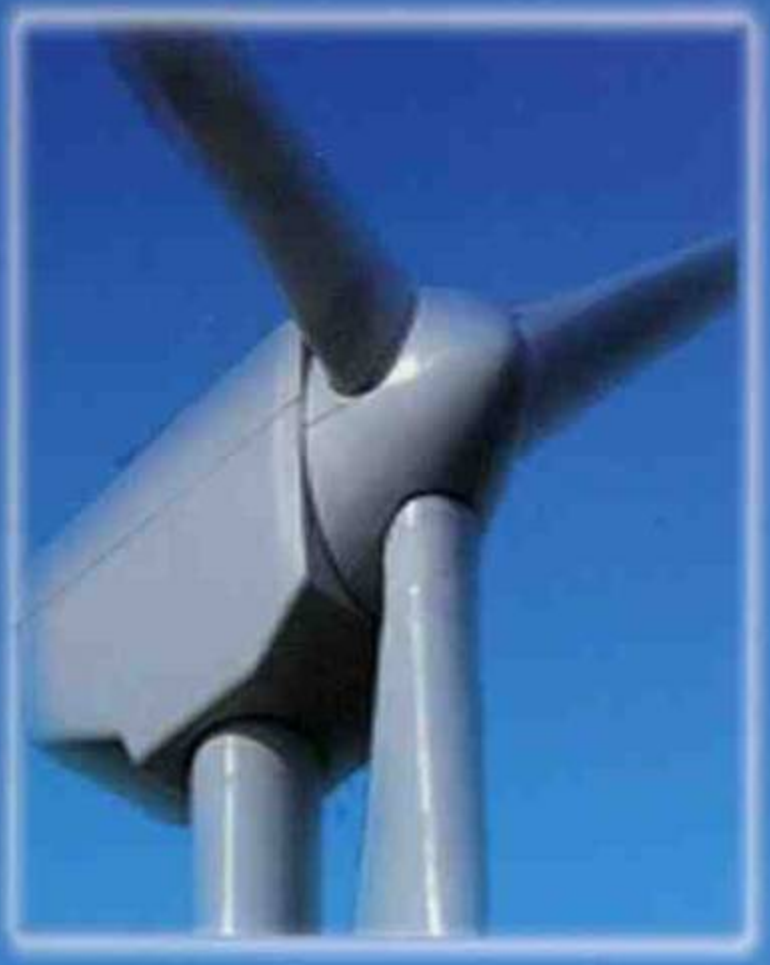
C-WET

ANNUAL REPORT

2000 - 2001



Centre for Wind Energy Technology

Chennai

CENTRE FOR WIND ENERGY TECHNOLOGY

(An Autonomous Institution of Government of India)

R-8, North Main Road, Anna Nagar West Extension, Chennai - 600 101.

C-WET

THIRD ANNUAL REPORT

2000 – 2001

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GENERAL INFORMATION

Chairman of the Governing Council and President of the Society

Shri N.N. Mookerjee from 15.05.1999 to 10.09.2000
Shri J.N.L. Srivastava from 11.09.2000 to 28.11.2000
Shri P.M. Nair from 29.11.2000
Secretary, Ministry of Non-Conventional Energy Source, New Delhi

Executive Director and Member-Secretary of Governing Council

Shri Ajit K.Gupta,
Adviser & Head, Power Group,
Ministry of Non-Conventional Energy Source, New Delhi.

Governing Council Members

Shri C.S. Rao, AS&FA, Ministry of Non-Conventional Energy Sources, New Delhi
Shri Lal Rawna Sailo, Secretary, Energy, Government of Tamil Nadu, Chennai
Shri S. Nautiyal, Director General, Bureau of Indian Standards, New Delhi
Shri D.V. Khera, Chairman, Central Electricity Authority, New Delhi
Dr. V. Bakthavatsalam, Managing Director, IREDA, New Delhi
Dr. T.S. Prahlad, Director, National Aerospace Laboratory, Bangalore
Dr. V. Siddhartha, Senior Adviser (ER&IPR), DRDO, New Delhi
Shri V.K. Neelakandhan, Director, ER&DCI, Thiruvananthapuram
Shri Sarvesh Kumar, Chairman, IWTMA, Chennai

Auditors:

M/s K. Gnanandandulu & Co.,
Chartered Accountants
Chennai – 600 006

Bankers:

Canara Bank
Anna Nagar West Extension
Chennai – 600 101

Registered Office:

R-8, North Main Road
Anna Nagar West Extension
Chennai – 600 101

ANNUAL REPORT 2000 - 2001

1.0 INTRODUCTION

1.1 The energy scenario in India has undergone a substantial change since Independence with the installed capacity going up from a meagre 2300 MW in 1950 to about 100,000 MW at present. This capacity is, however, grossly inadequate to meet the full demand. The per capita consumption, which is an indicator of the economic development of a nation, is only about 350 kwh, which is extremely low when compared to the per capita consumption of the developed countries. The power shortages cause tremendous setback to the overall industrial and agricultural development, ultimately affecting the GDP. It is estimated that a capacity addition of about 10,000 MW would be required each year for the next ten years in order to bridge the demand-supply gap.

1.2 Almost two-thirds of the total installed capacity in India is from the thermal sector, with the balance coming mainly from the hydro sector. The major issues of concern in thermal power generation are depletion of fossil fuels, pollution caused by emissions of obnoxious gases and high cost of transportation of coal. In the case of hydro power generation the progress is very slow because of high capital cost, long gestation period, legal issues arising from displacement of settlements and environmental and ecological disturbances.

1.3 Considering the above issues, the Government of India initiated several innovative programmes to harness the enormous potential from non-conventional energy sources in the early eighties. Of all the renewable energy sources, wind energy has proved to be the most promising in view of the matured technology and economic viability. India is endowed with a substantial wind resource base due to its unique geographic and climatic features, with exposure to both the south-west and north-east monsoon circulations. The westerly winds carry the bulk of the wind power potential, almost to the extent of 75 per cent. The wind power potential in the country is estimated on the basis of a countrywide wind resource assessment programme and the current wind technology. The total potential in India has been re-assessed as 45,000 MW and the technical potential has been estimated at around 13,000 MW **(Table-1).**

WIND POWER POTENTIAL IN INDIA			Table-1
Sl. No.	State	Gross Potential (MW)	Technical Potential (MW)
1.	Maharashtra	3650	2990
2.	Gujarat	9675	1750
3.	Tamil Nadu	3050	1700
4.	Andhra Pradesh	8275	1550
5.	Madhya Pradesh	5500	1200
6.	Karnataka	6620	1025
7.	Rajasthan	5400	885
8.	Orissa	1700	680
9.	Kerala	875	605
10.	West Bengal	450	450
	Total	**45195**	**12835**

(a) The gross potential is estimated assuming 1 % land availability for wind power generation in the potential areas.

(b) The technical potential is estimated assuming 20% grid penetration. The grid capacities include the share of capacity allocated to States from the power stations of the Central sector power generating utilities.

Panoramic view of the Wind Farm Project in Kayathar, Tuticorin District, Tamil Nadu

1.4 The Wind Turbine Generating System (WTGS) in grid-connected mode was introduced in India during 1984-85 with the installation of 55 kW WTGS in demonstration projects in four States. Since then, the wind sector has grown steadily in view of its techno-economic advantages besides the thrust and promotional policies of the government. The installed capacity of wind power in India has increased to 1340 MW as on 31st March 2001 **(Table-2)**. India now ranks first in Asia and fifth in the world after Germany, USA, Spain and Denmark in the promotion of wind energy **(Table-3)**. About a dozen companies are engaged in the production/assembly of WTGS with different levels of indigenisation. The unit size ranges from 225 kW to 1000 kW. Swept areas have increased with large rotor diameters of up to 60 metres and the hub heights have gone up to 70 metres.

Table-2

TATE-WISE INSTALLED CAPACITY OF WIND POWER AS ON 31.03.2001(In MW)

State	Demonstration Projects	Private Sector Projects	Total Capacity
Tamil Nadu	19.4	793.2	812.6
Maharashtra	6.4	183.4	189.8
Gujarat	17.3	149.6	166.9
Andhra Pradesh	5.4	86.5	91.9
Karnataka	2.6	42.0	44.6
Madhya Pradesh	0.6	22.0	22.6
Rajasthan	6.4	0.9	7.3
Kerala	2.0	-	2.0
West Bengal	0.5	-	0.5
Others	1.6	-	1.6
Total	**62.2**	**1277.6**	**1339.8**

WORLD-WIDE INSTALLED CAPACITY OF WIND POWER

Table-3

Sl. No.	Country	Capacity (MW)
1.	Germany	6560
2.	United States of America	2600
3.	Spain	2582
4.	Denmark	2325
5.	India	1340
6.	Netherlands	458
7.	Italy	427
8.	United Kingdom	409
9.	China	361
10.	Greece	254
11.	Other Countries	1394
	Total	**18710**

1.5 Since the mid-seventies, when work began in earnest on harnessing the wind energy, the development of wind energy technology has made a significant progress. Modern wind turbine generating systems are far removed from their historic predecessors. They are highly sophisticated systems built on aerodynamic principles developed from the aerospace industry, incorporating advanced materials and electronics, and are designed to deliver energy across a wide range of wind speeds. The technical feasibility of using wind as a major source of energy has now been established and wind energy today ranks as one of the most promising among the renewable energy technologies for generating electricity globally.

Hon'ble Prime Minister dedicating Wind Turbine Test Station to the nation on 5th July, 2000

1.6 The trend of installing WTGS with higher rated capacities is continuing. The 750-1000 kW machines have been further refined and the manufacturers have begun producing commercial machines rated at 2 MW. Various countries are evaluating the wind energy technology and its potential contribution to their national energy supply, taking into account economic viability and environmental concerns. The reduction of greenhouse gas emissions is one of the main thrusts of the programmes. Diversification of energy supply and the development of a sustainable wind energy market are also seen as advantageous for most countries.

1.7 The Ministry of Non-Conventional Energy Sources (MNES) felt the need for an institution to provide technical support to the wind energy sector, in order to create a healthy and an orderly growth. In this context, a Memorandum of Understanding (MoU) was signed between the Government of India and the Government of Denmark in 1997. In accordance with the MoU, the Government of

India established the Centre for Wind Energy Technology (C-WET) as an autonomous institution in Chennai in 1998. It is a public research institution fully funded by the Government of India with technical and partial financial assistance from the Government of Denmark. It was registered as a Society under Tamil Nadu Societies Registration Act, 1975 on 21st March 1998. The Department of Scientific and Industrial Research in the Ministry of Science and Technology has recognized the Centre as a scientific and industrial research organization. Shri. M. Kannappan, Hon'ble Union Minister of State (Independent Charge) for Non-Conventional Energy Sources dedicated the Centre to the Nation on 6th December 1999. A Wind Turbine Test Station (WTTS) has been established as an integral part of the Centre at Kayathar in Thoothukudi District of Tamil Nadu. It was dedicated to the Nation by Hon'ble Prime Minister on 5th July 2000.

Hon'ble Union Minister of State for Non-Conventional Energy Sources and Her Excellency the Ambassador of Denmark at the Wind Turbine Test Station

1.8 The objectives of the Centre are:

- 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 providing support to 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 a 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 power 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 to conduct and/or coordinate testing of complete wind power systems, sub-systems and components according to internationally accepted test procedures and criteria whereby the total performance, such as the power performance, power quality, noise level,

dynamics, operation and safety systems, is tested according to agreed protocols.

- To accord type approval/type certification, which confirms conformity with safety-related requirements as per the standards, guidelines and other rules for design, operation and maintenance, as well as adequate documentation of quality issues such as power performance, noise, life expectancy and reliability.
- To monitor the field performance of wind power systems, sub-systems and components, effectively utilise this feedback for fulfillment of the above objectives and review 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 and know-why resulting from R&D and offer various consultancy services to the customers.
- To promote the development and commercialization of any other wind energy systems including stand-alone systems.

1.9 The Centre functions through five units, namely, Research & Development, Wind Resources Assessment, Standards & Certification, Wind Turbine Testing and Information, Training and Commercial Services. It is at present housed in rented premises in Chennai. The Government of Tamil Nadu has granted permission to 'enter-upon' a land at Pallikaranai Village, Tambaram Taluk, Kancheepuram District (near Chennai) for the establishment of the campus of the Centre. Possession of the land was taken on 23rd March 2001. Fencing is being provided in front of the land. A Consultant Architect is being identified. The design of the building will be based on energy conscious architectural principles. A Building and Infrastructure Development Committee (BIDC) has been constituted to consider, finalise and recommend the Master Plan for the building and site development and to oversee all aspects of implementation.

1.10 The affairs of the Centre are managed, administered, directed and controlled by a Governing Council in accordance with the Rules and Regulations of the Centre and orders/directives received from the Government of India. The Secretary, Ministry of Non-Conventional Energy Sources, Government of India, is the ex-officio President of the Centre and ex-officio Chairman of the Governing Council. The Government of the year, the Governing Council was reconstituted. The tenure of the present Council is three years with effect from 18th February 2001. The list of

members of the Governing Council as on 31.03.2001 is given in **Appendix-I**. The Governing Council met twice during the year on 21st September 2000 and 26th March 2001 at Chennai. A Management Committee and a Finance Committee have been constituted to assist the Governing Council.

2.0 WIND RESOURCE ASSESSMENT

2.1 The wind monitoring programme involves identification of high wind area, establishment of wind monitoring stations, collection and processing of time series data on wind speed and direction at 10 m and 20/25 m agl. for periods of two to three years at these stations. At present, 82 wind monitoring stations are in operation in 14 States and Union Territory **(Table-4)**.

2.2 The wind monitoring programme is being implemented in coordination with the State Nodal Agencies. Under this programme, 430 wind monitoring stations were established in 20 States and Union Territories. The stations with mean annual wind power density at 30 m agl. more than 150 W/m^2 have been considered suitable for setting up commercial wind power projects. As many as 208 potential sites have so far been identified in 13 States/Union Territories viz. Tamil Nadu,

Table-4

WIND MONITORING STATIONS

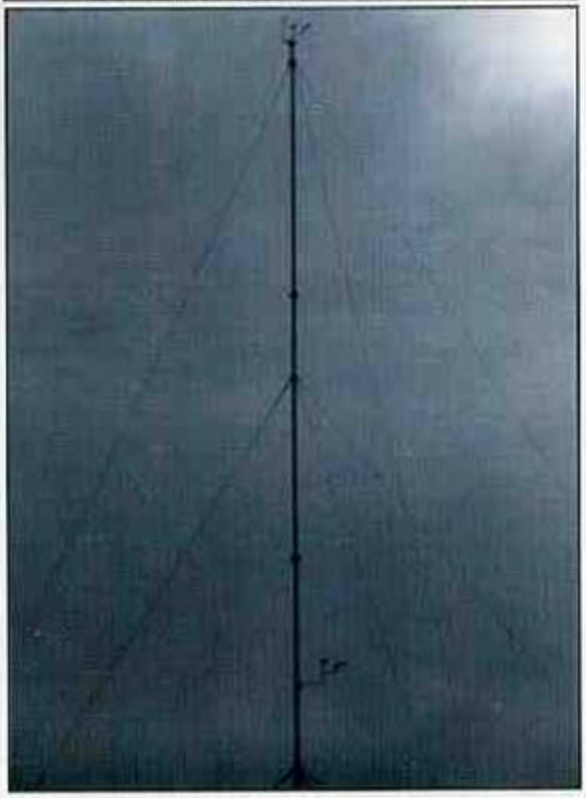
Sl. No.	State	No. of Stations			
		As on 01-04-2000	Commissioned during the year	Closed down during the year	As on 31-03-2001
1	Maharashtra	16	10	9	17
2	Gujarat	14	2	4	12
3	Andhra Pradesh	10	10	9	11
4	Karnataka	9	6	4	11
5	Tamil Nadu	9	6	5	10
6	Rajasthan	1	4	-	5
7	Madhya Pradesh	9	3	7	5
8	Himachal Pradesh	-	4	-	4
9	Jammu & Kashmir	4	-	1	3
10	West Bengal	2	-	-	2
11	Lakshadweep	2	1	2	1
12	Kerala	8	-	7	1
13	Punjab	3	-	3	-
14	Haryana	2	-	2	-
	Total	89	46	53	82

Gujarat, Orissa, Maharashtra, Andhra Pradesh, Rajasthan, Lakshdweep, Karnataka, Madhya Pradesh, Kerala, West Bengal, Andaman & Nicobar and Uttaranchal. **(Appendix- II)**.

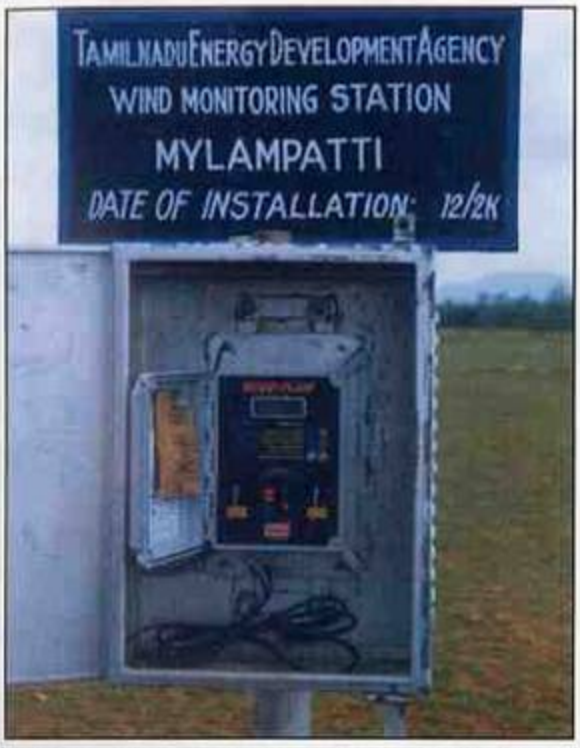
2.3 Comprehensive data on wind resource for 153 wind monitoring stations has so far been published in five Handbooks on "Wind Energy Resource Survey in India". The sixth volume containing data for 55 wind-monitoring stations in 16 States and Union Territories is under publication. The data is presented in the following form:

- A summary of the station's data giving monthly mean wind speed, its standard deviation, hourly maximum, peak wind speed, lull period in hours and predominant wind direction in each month.
- Hourly mean values of wind speed for each day for different months together with the standard deviations in tabular form.
- Wind data in the form of diurnal variation graphs for 12 months.
- Monthly mean wind speeds depicted by diagrams.
- Monthly mean wind power density in a diagrammatic form
- Mean annual percentage frequency distribution of hourly wind speeds and the distribution of wind power density in tabular form.

The 25m wind monitoring mast at Mylampatti, Tamil Nadu showing the sensors and data logger



Close-up view of the 10m and 25m level sensors installed at Mylampatti, Tamil Nadu



Close-up view of the NRG data logger installed at Mylampatti, Tamil Nadu

- Mean annual percentage frequency distribution of hourly wind speeds in diagrammatic form along with corresponding percentage distribution of wind power densities for the same speed intervals.
- Wind rose diagrams for twelve months of the year.
- Wind rose data in a numerical form for each station.

A Data Bank on wind meteorology in India is being developed. Meteorological data is being collected from various sources for the Data Bank.

2.4 A reassessment of the wind power potential was carried out under two scenarios at 30 m and 50 m above ground level (agl.) for 10 potential States. The potential at 50 m with 1% availability of land area has been estimated at over 45,000 MW.

2.5 A project on micro-survey was initiated to assess the "Zone of Influence" and the potential available around selected wind monitoring stations. The measured wind data is normally valid only at the location of measurement. Various models have been used in order to predict the wind resource over an extended area around the observation point. Seventy-five potential sites, where wind power density is greater than 150 W/m^2 at 30 m agl in 10 States were taken up for this survey. Wind analysis, estimation of wind energy potential and a Master Plan have been prepared for each of the 75 sites. The State-wise number of wind monitoring stations taken up for micro-survey is given in **Table-5**

Table-5

WIND MONITORING STATIONS FOR MICRO-SURVEY

Sl. No.	State	No. of wind monitoring stations
1	Tamil Nadu	16
2	Gujarat	15
3	Maharashtra	13
4	Karnataka	12
5	Andhra Pradesh	9
6	Rajasthan	3
7	Madhya Pradesh	3
8	Orissa	2
9	West Bengal	1
10	Kerala	1
	Total	**75**

2.6 The information contained in the micro-survey reports covers the following:

- 20 km x 20 km domain covered around a wind monitoring station with a grid of 1 km x 1 km (400 points). Survey of India 1:50,000 topo maps (with 20 m contour) were used for the purpose.
- Geographic coordinates, elevation, approach details, nearest railway station, airport, topography/ orography, roughness details, soil condition, etc.,
- Map showing the administrative level of the location viz., State, District, Taluk etc.,
- Details of formatted wind data used and tables showing vertical/horizontal validation.
- The wind resource in terms of WS, WPD, Weibull parameters of the entire area (400 sq. km) at 10, 30, 40 and 50 m agl at all grid points.
- Map showing wind resource i.e., wind speed and wind power density at 30,40,50 m agl.
- Map showing natural exclusions considered in the entire area.
- Map showing delineated area for wind farm development with all details.
- Estimation of wind resource available at 30, 40 and 50 m agl, after all exclusions.
- Master Plan details of the identified sites for wind farm development with particulars such as useful area, elevation of the area, soil condition, orography, capacity rating, grid details and proposed grid interconnection, cost of land etc.

The estimated wind energy potential from the 75 micro-survey sites works out to 14,906 MW at 50 m agl. The site-wise estimated potential for each of the 10 States is given in **Appendix-III**. Copies of the micro-survey report have been provided to the concerned State Nodal Agencies for planning wind power projects. Copies of these reports have also been offered for sale at a nominal price. Micro-survey studies and preparation of Master Plans for additional 25 wind monitoring stations are proposed to be taken up.

2.7 The North Eastern region is endowed with low levels of wind resource potential compared to the other regions of the country as per general climatic considerations. It was, therefore, felt that the conventional approach of selecting sites might not yield the desired results in this region. Realizing this a special programme was initiated to locate windy sites in this region, including Sikkim, with the help of two wind energy consultants. The following methodology was adopted to carry out this work:

- Study the general wind potential in the region with all the available wind data including surface and upper winds. This includes wind data collected under wind mapping and wind monitoring programme in the region, data from IMD and other sources.

- In conjunction with the available wind data, study the topography of the region to locate hi-wind sites in a general way and look for sites with winds originating from local wind systems.
- Suggest sites based on the study of available data and topography for taking up a measurement programme using 10 m mast and distant reading cup counter anemometers.
- After collecting the data for about 3 months at each identified location, shift the mast to a new location and collect data from the new site. Each State was given six masts and necessary instruments.
- The data thus collected is to be studied by the consultants and finally a few locations are to be suggested in each State for long-term wind monitoring, using dedicated mast (25 m) with automated instruments.

2.8 Based on the findings of the special programme, 27 sites were selected for long-term anemometry in the North Eastern region **(Table-6)**

Table-6

SITES SELECTED FOR LONG-TERM ANEMOMETRY

Name of the States and Sites
Arunachal Pradesh
Sela Pass
Raga
Rupa
Likabali
Shimong-Yinkiong
Assam
P. Leikul
Kalimkhu/Muldum
Tolpoi
Manipur
Laimaton
Tamenlong/Kollen
Maring Phumon
Tengnoupal
Phungyar/Phangrai
Meghalaya
Nongbah/Mynso
Maryngksihi
Mauphlang
Mizoram
Sekawrhmuai Tlang
Reiek
Hmuifang Tlang
Theriat Tlang
Thingfal
Sikkim
Bunker point/Kerang
Thangu
Sherthang
Tripura
Betling Sib
Vaisam/Thangsang
Niungmamura/Bichangpara

2.9 A consultancy project on wind monitoring and resource analysis was carried out at Hulikatte for the National Thermal Power Corporation Ltd., Hyderabad. The scope of the work covered wind measurement at 30 m agl. for a period of one year, analysis of data, and preparation of technical report using flow models. The wind monitoring station was commissioned at Hulikatte village in December 1999 and data for one year was collected. Analysis of the wind data was carried out and presented. Wind resource at and around Hulikatte wind monitoring station was analysed by using WAsP, a PC based wind flow model. A Digital Terrain Model (DTM) showing an isometric view of the region of interest was also generated. Annual energy generation was estimated for the site.

2.10 A consultancy project on micro level analysis of wind data for wind farm sites is under execution at Varapatti (existing wind farm) and Chandirapuram villages in Palladam Taluk of Coimbatore in one square kilometer area. The WAsP model is to be used for prediction of wind resources in the region of interest. A consultancy project for commissioning of five wind monitoring stations and collection and analysis of data for Maharashtra Energy Development Agency (MEDA) is also under way.

2.11 A programme to study wind shear has been initiated. One mast each of 50m height has been installed at Vajrakarur in Andhra Pradesh and Nelganti in Karnataka.

The 50m wind monitoring mast installed at Nelganti, Karnataka.

The programme will be expanded to a few other locations in different climatic regions. Quantitative estimates of the power law index, which is a very important parameter in wind resource assessment, will be obtained. A special study of wind resource in Kargil/ Nubra valley in Ladakh, Jammu & Kashmir, is planned to be taken up in association with the National Aerospace Laboratories, Bangalore to identify the wind potential in the area.

2.12 A project titled "Study of Ruggedness Index (RIX) in Complex Terrain" was undertaken to analyse the terrain complexity

in India in terms of RIX, a parameter available in WAsP Utility Program. Jogimatti, Kapattaguda and Hanumanhatti in Karnataka, Vankusavade in Maharashtra and Kanjikode in Kerala were taken up for the study. Another project titled "Development of 4-Dimensional Wind-resource Database covering Indian Region alongwith a Graphic User Interface" is being developed. This will lead to the preparation of a Wind Atlas for India in association with the CSIR Centre for Mathematical Modeling and Computer Simulation (C-MMACS), Bangalore. The preparation of a proposal for a feasibility study of offshore wind power projects and feasibility of deployment of wind diesel systems in island territories has been initiated. A team visited Andaman and Nicobar Islands to assess the potential for wind power development in the Islands.

3.0 RESEARCH & DEVELOPMENT

3.1 The research and development (R&D) programme in the wind energy sector aims to

- develop new designs and technology appropriate to wind regimes and conditions in India;
- maximise energy conversion from wind;
- improve the quality of the components and the system as a whole;
- maximise the reliability and availability;
- minimise the weights and cost of the system in order to minimize overall capital cost as well as generation cost per kilowatt-hour; and

Engineers working on Digital Storage Oscilloscope in C-WET's R&D Laboratory in Chennai

- keep pace with state-of-the-art technologies.

The Centre is carrying out in-house R&D and coordinating R&D programmes with academic institutions, industry, experts and consultants working in a spectrum of disciplines.

The ultimate objective of this is to disseminate the R&D information for the overall benefit of the wind sector and assist the industry in the production of cost-effective, high quality wind power systems.

3.2 A Research & Development Council (RC) has been constituted, comprising of eminent scientists and engineers, to guide the Centre in its research, development, test and evaluation programmes and projects. The composition of the Research & Development Council is given in **Appendix-IV**. The RC met thrice during the year; on 26th May 2000 at Chennai, 22nd December 2000 at Bangalore and on 26th March 2001 at Chennai.

3.3 The following are the five generic areas of the R&D activities of the Centre.

- Wind resource assessment and related studies;
- Improvement in the performance of existing grid-connected wind turbine installations;
- Wind-diesel systems for off-grid areas;
- Technology support to wind power industry and manpower training; and
- Research and advanced technology development

The terms of reference of the RC and the generic areas of R&D activities are given in **Appendix-V**

3.4 The following projects are under execution for making an improvement in the performance of the existing grid-connected wind turbine generating systems.

3.4.1 Grid-related Investigations of Wind Farms: The objective is to study the effects of grid-related problems like grid outages, frequency variations, voltage variations, transients, flicker and harmonics on the WTGs and to recommend procedures for improvement of power quality. The project also envisages studying the compatibility of the existing protection systems against these grid problems and recommending methods to improve the outgoing power fed from the WTGs to the grid. The critical parameters like reactive power, grid shutdown, voltage variation and frequency variation have been identified for analysis in consultation with State Electricity Boards, State Nodal Agencies and Developers.

3.4.2 Optimal Blade Angle for Energy Maximisation: The object is to review the optimization of blade angle to get optimum output within the design loads through experimental verifications. This would guide the fixing of the pitch angle of the blades for a stall regulated WTGs according to the prevailing site conditions. Increasing the pitch angle can increase the power and hence the annual energy production. However, correspondingly, the loads on the WTGs would also increase. The project will review these aspects based on experimentation in the site. Theoretical study on the aerodynamics of the blade element for the project has been completed. The experimentation will be carried out in the windy season of 2001.

Intelligent Wind Controller designed and developed indigenously, installed in Wind Turbine at Muppandal, Tamil Nadu.

3.4.3 Development of Advanced Static Var Compensator (ASVC): The WTG systems with near constant speed induction generators draw large amount of reactive power from the grid and thus results in poor power factor. The reactive power demand limits the maximum

permitted amount of wind power that can be connected to the grid. Power quality and stability of the grid is also affected by the poor power factor exhibited by the wind energy generators. In this project, an ASVC will be developed as a solution for the above problem. This will also stabilize the steady state voltage at the wind farm grid. Efforts are being made to develop the ASVC with the participation of the industry.

3.4.4 Failure Analysis of Gear Boxes of Wind Turbines: Gearbox is the most critical and costly component of a WTGS. Any failure in the gearbox would be a costly and time-consuming process. The reasons for failures may be impact loading, variable loads, non-replacement of lubricants as per schedule, design related problems, materials problems, heat treatment etc. It is proposed to collect data and carry out the analysis on failure of gearboxes. Based on the study, modifications will be recommended if any design deficiencies are found. This will help in reducing the costs of repairs and replacement of gearboxes and in increasing the availability of the system for generation.

3.5 A project will be executed to develop an indigenous high-penetration wind-diesel hybrid system that can be used at remote diesel grid sites, such as Lakshadweep Islands, Andaman & Nicobar Islands and in the Himalayan belt as these sites enjoy fairly good wind speeds. The system will have supervisory control over the diesel gensets, the dump loads and the battery bank and will disconnect the diesel gensets when it is not required so as to minimize the consumption of fuel.

3.6 A wind power system performance evaluation facility and a technology demonstration wind farm will be established to provide technology support to industry and manpower training. The facility in the wind farm will be utilized to make a detailed study of each component and sub-system vis-à-vis its function and performance in the integrated system and in carrying out various R&D activities on a continuous basis.

3.7 A project titled "Blade Design and Development" will be executed to develop a WTGS blade profile for capturing maximum wind energy without much increase in the rotor diameter so as to avoid increased loads on the rotor.

3.8 Collaborative research is absolutely essential to achieve the objectives set out for R&D in wind energy sector in a cost-effective manner. The Centre will network with other R&D institutions in the country having expertise in various disciplines of engineering related to the wind energy sector.

4.0 STANDARDS & CERTIFICATION

4.1 The Centre undertakes activities relating to Provisional Type Certification (PTC) of WTGS according to the "Type Approval - Provisional Scheme – 2000 (TAPS-2000)"; issue of Provisional Type Certificates; formulation of Type Approval Scheme (TAS) by improving TAPS-2000 based on the

experiences gained; and preparation of Indian Standards for wind energy sector in line with International Standards (IEC).

4.2 The TAPS–2000 has been prepared in line with International Certification Standards (draft IEC 61400 – 22: Wind Turbine Certification and IEC 61400 –1, Part1: Safety Requirements) in association with the Technical Consultant of DANIDA, M/s RISO National Laboratory, Denmark. The requirements of provisional type testing and measurements were also incorporated. The Scheme TAPS-2000 was approved by the Ministry of Non-Conventional Energy Sources in May 2000 and incorporated as a part of the guidelines for the wind energy sector. TAPS–2000 is valid for the inland WTGS and is applicable only to the grid- connected, horizontal-axis WTGS with rotor swept area greater than 40 m^2.

4.3 The TAPS-2000 will cover the whole WTGS up to and including WTGS terminals and from the terminals to the grid; the whole process covering design, manufacturing and installation; verification of documentation provided by WTGS manufacturers/suppliers for type approval and evaluation of quality assurance systems for design, manufacturing system and installation and supplemented by control calculations, tests and surveillance inspection; and verification of compliance with regard to current safety requirements.

4.4 The other activities include inspection of the WTGS certified under TAPS-2000 in order to check compliance with the approved type; dissemination of information about TAPS-2000 and the basis for approval to the users when required; participation in international co-operation concerning certification, test procedures and standards for WTGS to enable updating of TAPS-2000 and improvement of the TAPS-2000 by incorporating necessary changes based on the experience gained.

4.5 The TAPS-2000, has been formulated with the following three categories of Provisional Type Certification (PTC):

- Category-I: PTC for WTG systems already possessing valid type certificate or type approval.
- Category-II: PTC for WTG systems already possessing valid type certificate or type approval, with minor modifications/changes, including provisional type testing/ measurements at the test site of the Centre.
- Category-III: PTC for new or significantly modified WTG systems including provisional type testing and measurements at the test site of the Centre.

The Provisional Type Certificate is issued after performing the technical evaluation of the WTGS (WTGS type) based on the verification of the documentation provided by the manufacturer/supplier as per the TAPS –2000 and additional codes and standards chosen by the client manufacturer.

4.6 A Provisional Type Certification of WTGS V39-500 kW with 47 m rotor diameter of M/s Vestas RRB India Ltd, Chennai was taken up under Category-II according to TAPS-2000. The PTC was carried out alongwith the technical consultants of DANIDA, M/s RISO National Laboratory, Denmark. The safety and function tests of the WTGS were carried out at the Wind Turbine Test Station (WTTS), Kayathar, as a part of the requirements of TAPS-2000. The preparation of the PTC is in progress.

4.7 A Provisional Type Certification of WTGS N 3335 – 350 kW with 33.4 m rotor diameter of M/s Suzlon Energy Ltd., Ahmedabad, was taken up under Category–II, according to TAPS-2000. The PTC was carried out along with the technical consultants of DANIDA, M/s RISO National Laboratory, Denmark. The safety and function tests of the WTGS were carried out at the Wind Turbine Test Station (WTTS), Kayathar, as a part of the requirements of TAPS-2000. The preparation of the PTC is in progress.

4.8 Agreements have been executed for PTC of the WTGS model NEPC 225 kW with 29.6 m rotor diameter of M/s NEPC India Limited, Chennai and the WTGS model Suzlon 1000 kW with 60 m rotor diameter of M/s Suzlon Energy Limited, Ahmedabad.

4.9 The Centre has been asked to draw up the list of approved manufacturers with models of WTGS of unit capacity 225kW and above that have obtained type approval, including power curve certification, from designated international test stations and classification agencies as per para 3(1) of the revised Guidelines No. 66/53/2000-WE(PG) dated 23.10.2000 of MNES regarding re-introduction of the requirement of certification by independent testing and certification agencies.

4.10 A Standards Advisory Committee (SAC) has been constituted comprising of major stakeholders of the wind industry and the Bureau of Indian Standards (BIS) to guide the Centre in evolving strategies and planning for preparation of Indian standards for WTGS in line with the international standards (International Electro-technical Commission's (IEC) Standards) and other existing national standards. The Committee has recommended that the Centre can start the preparation of the standards in line with IEC **(Table-7)**

Table-7

STANDARDS TO BE PREPARED IN LINE WITH IEC

Sl. No	Indian Standard on	in line with
1.	WTGS safety requirements	IEC 61400- 1
2.	WTGS power performance testing	IEC 61400-12
3.	WTGS load measurements	IEC 61400-13
4.	Lightning Protection	IEC 61400-24

The work on the preparation of an Indian standard on WTGS safety requirements in line with IEC 61400-1, taking into account the Indian Environmental conditions, has been initiated.

4.11 A quality management system (QMS) has been formulated. The quality policy the Centre envisages the following:

- Offer of prompt, credible and innovative solutions at affordable cost to meet the requirement and expectations of clients and
- Commitment to be a self-supporting technical focal point of excellence for the development of the wind energy sector.

The draft procedures and instructions to be adopted for the three categories of type certification as mentioned in TAPS-2000 have been prepared.

5.0 WIND TURBINE TESTING

5.1 During the past two decades several manufacturers have developed WTGS of different designs and introduced in the global market after extensive in-house testing. The design assumptions and concepts in the manufacture of the WTGS are verified by the concerned manufacturer through reputed technical institutions and research laboratories to demonstrate that the entire structural, electrical and mechanical elements in the WTGS are functioning within the set safety standards and with high reliability and that the system attains its rated output at the rated input. Moreover, testing the WTGS of different designs is essential to the manufacturer to compete in the developing market due to the large-scale private sector participation in the establishment of wind farms and to prove in the commercial market the high degree of performance capability and reliability of their WTGS. Attempts were made in the late seventies in Europe to formulate a set of basic testing procedures after detailed and extensive deliberations among the European R&D institutions. The testing procedures have undergone certain changes from time to time taking into consideration of the design inventions. Testing of WTGS is, therefore, vital to the entire wind energy sector, especially to the manufacturer attempting to arrive at a well-defined power performance and safety system, to the developer in search of a machine with reliable performance and optimum output, to certification agencies and to financial institutions.

5.2 A Wind Turbine Test Station (WTTS) was set up as an integral part of the Centre with technical and partial financial assistance of DANIDA. M/s RISO National Laboratory, Denmark, a reputed R&D institution in Europe, were appointed as the technical consultants to the Project. WTTS is located in the southern part of Tamil Nadu at Ayyanaruthu Village, Kovilpatti Taluk in Thoothukudi District within the project site of the demonstration wind farm at Kayathar. It is about 575 kms away from Chennai on the way to Kanyakumari. The wind flow in that area is predominantly from the western direction through the Shencottah Pass in the Western Mountain ranges. The Pass is about 50 kms west of the Wind Turbine Test Station.

View of the Wind Turbine Test Station at Kayathar showing the Wind Turbine under test, Control Room and Wind Monitoring Mast

5.3 The terrain of the land at WTTS provides ideal conditions for testing of WTGS as the terrain variations comply with the requirements of IEC. The terrain of the site is flat with practically no obstacles and is gently sloping from the test site towards the western direction. There are clusters of coconut and palm trees having a height of 10m and a width of 800m at a distance of 950 m from the test beds in the western direction. These obstacles are quite far away from the test beds, more than 20 times of the rotor diameter of the test WTGS, and they have no wake effect on the testing of WTGS.

5.4 The Ministry of Non-Conventional Energy Sources, Government of India, has constituted a Steering Committee to formulate the broad policies, to plan and to approve the budget for the functioning of the WTTS within the overall framework of the Centre. The composition of the Steering Committee is given in **Appendix-VI.** The WTTS was dedicated to the Nation by Shri Atal Bihari Vajpayee, Hon'ble Prime Minister of India, on 5th July 2000 in the presence of late Shri P.R. Kumarmangalam, the then Hon'ble Minister of Power; Shri M. Kannappan, Hon'ble Union Minister of State (Independent charge) for Non-Conventional Energy Sources; Shri Arcot N. Veerasamy, the then Hon'ble Minister for Health and Electricity, Government of Tamil Nadu; Her Excellency, Ms. B.S. Madsen, Ambassador of Denmark to India and late Shri N.N. Mookerjee, the then Secretary, MNES.

Hon'ble Union Minister of State for Non-Conventional Energy Sources and Her Excellency the Ambassador of Denmark to India inaugurating one of the Test Beds and Control Rooms at Kayathar

5.5 The project was originally scheduled to be implemented in three phases. This was later modified to two phases, merging the Phase 2 and 3 together. The Phase 1 of the project started in January 1999, and concluded in April 2000 with the following outputs:

- Proven capability for *In Situ* Power Performance Tests.

- Establishment of WTTS with infrastructure for carrying out modified basic testing programme under homogeneous terrain conditions.
- Draft design criteria for WTGS based on international standards adapted for Indian conditions and needs.
- Rules and procedures for a provisional type approval system based on type certification.

5.6 At the end of Phase 1 a joint project review was made by DANIDA and MNES. The Review Mission and the subsequent DANIDA Mission concluded that Phase 1 had been successfully completed and the activities of the Phase 2 could be commenced as per the MoU. The main activities for implementation of Phase 2 are:

- Windy season 2001 to be used for basic testing with some vital additional testing such as rotor load measurements, etc.
- Windy season 2002 to be used for full system testing by the Centre assisted by the technical consultant (TC).
- Windy season 2003 to be used for full system testing by the Centre with the supervision of TC.
- Training on activities of blade testing.
- Variable speed WTGS to be included in TC's technical assistance.

5.7 Infrastructure facility has been created for conducting type testing of two WTG systems with a total capacity of 1 MW. The test bed 'A' on the northern side of the WTTS has the facility to test WTG systems of capacity up to 600 kW. The test bed 'B' on the southern side of WTTS has the facility to test WTG systems of upto 400 kW capacity. The two test beds are connected to the 11kV network of Tamilnadu Electricity Board with two 11kV bays constructed close to each test bed. Two control rooms have been constructed one at each test bed. The control room measures 4m x 3m and has the facility to accommodate the control panels of the client manufacturer. Data acquisition system has been installed in each control room. A PC-based data logging system is used for recording the power performance, safety and load measurements. The PC is a DOS based system and of 66Hz, 486 microprocessor-based system. It is set up for 24 analog channels and 13 digital channels. The sampling frequency normally used is 200Hz post averaged to 25 Hz. The wind speed signals are transmitted as frequency modulated signals while the rest of the signals are transmitted as ± 5V DC signals. The basic parameters which are to be measured at WTTS are given in **Table-8.**

Table - 8

Basic Parameters to measured at WTTS

Met Mast	**Nacelle**
Wind speed at hub height	Rotor speed
Wind speed at reference height	Rotor position
Wind direction sine at reference height	Rotor status
Wind direction cosine at reference height	Yaw direction
Wind direction	**Control panel**
Relative humidity	Active power
Air temperature	Reactive power
Rain	Grid frequency
Barometric pressure	Status signal grid connected on /off Status signal brake on/off

5.8 The meterological parameters are measured by placing sensors on the top of the meterological masts erected in front of the test WTGS. The met masts are at a distance of two to four times of the rotor diameter of the WTGS under test. There are two masts at WTTS, one designed for a hub height of 50 metres and the other designed for a hub height of 75 metres, each having a cross section of 0.5 x 0.5 m and are guy supported. The heights can be altered with the ultimate height to match the hub height of the WTGS under test.

5.9 The *in situ* power performance tests were conducted during the windy season 1999 for two WTG systems as detailed below:

- 500 kW, 39m rotor diameter of Vestas RRB India Ltd., at Pazhavur village near Muppandai in Tirunelveli district;
- 250 kW, 29.7m rotor diameter of BHEL make at TPL wind farm, Varapatti village near Palladam in Coimbatore district.

The assessment of power performance of a WTG system is the most important parameter for determining the economic viability of a wind project. In the *in situ* power performance test, the output is a measured power curve of the system at the site where it is erected and hence it is site specific. This ultimately provides the client an easy method to calculate the annual energy production of his test machine under the prevailing climatic conditions of the site. The engineers of WTTS have acquired necessary technical training from M/s RISO National Laboratory, Denmark and sophisticated instruments were utilized to carry out *in situ* power performance test on WTG systems. The duration of a field test is normally one to two months during the predominant wind season.

5.10 The basic test on a WTG system is conducted with the main purpose of observing and recording its specific properties with regard to the energy generation and safety systems. The basic test consists of:

- Manual function test;
- Test of the protection system of the wind turbine;
- Power curve measurement;
- Yaw efficiency measurement;
- Power quality measurement;
- Noise measurement;
- Natural frequency measurement at standstill

5.11 The type test is carried out at the WTTS. The WTG system to be tested is brought to the WTTS by the client manufacturer and erected at the test bed earmarked to them. It is connected to the grid readily available at WTTS and the test is commenced. The type test comprises power curve measurement, manual function test, test on the protection systems, yaw efficiency measurement and load measurement on the rotor shaft. The total duration of all these tests is about five months during the windy season of the year, which is normally from May to September.

5.12 The Centre carried out the provisional type testing on two WTG systems, 500 kW with 47m rotor diameter of Vestas RRB India Limited and 350 kW 33.4m rotor diameter of Suzlon Energy Limited during the windy season 2000 in technical co-ordination with experts from M/s RISO National Laboratory, who imparted on-the-job training in testing, safety systems, instrumentations, data acquisition system and calibration analysis of data acquired during various test and assisted in preparation of Test

Reports. The Secretary, Ministry of Non-Conventional Energy Sources, presented the Test Reports to the client-manufacturers at Chennai on 26th March 2001 in the presence of the members of the Governing Council.

Shri P.M. Nair, Secretary, Ministry of Non-Conventional Energy Sources and Chairman, Governing Council of C-WET presenting Test Reports to Client Manufacturers at Chennai on 26.03.2001.

5.13 Action has been initiated for the creation of additional infrastructure facilities for 0.40 MW in order to conduct tests on two WTG systems with a total capacity of 1.40 MW. Agreements have been executed to conduct provisional type testing of two WTG systems (1000 kW, 60 m Rotor diameter of Suzlon Energy Limited and 225 kW, 29.6m Rotor diameter of NEPC India Limited) at WTTS during the windy season 2001.

6.0 INFORMATION, TRAINING AND COMMERCIAL SERVICES

6.1 A library is being developed with technical books and journals to cater to the day-to-day needs of the technical personnel of the Centre for reference material on various related subjects and to know the latest development across the globe.

6.2 A presentation was made to the delegation led by Mr. Zhou Wenzhi, Vice-Minister of Water Resources, Peoples Republic of China, on 20th December 2000 at Chennai about the activities of the Centre and the possibility of providing various services of the Centre for development of the wind power sector in China.

6.3 A presentation was made at the Agency for Non-Conventional Energy and Rural Technology (ANERT), Thiruvananthapuram, on 4th December 2000 on wind power potential in Kerala and on the activities of the Centre. A report on wind power potential in Kerala was prepared and provided to ANERT.

Training on Data Acquisition System and Calibration by Danish Engineer at the Test Station.

Training Programme on Certification by Danish Engineer at C-WET, Chennai.

6.4 The following training programmes were conducted by DANIDA through its technical consultants, M/s RISO National Laboratory, Denmark:

- Training on instrumentation of meteorological mast and data acquisition system at Kayathar from 11.04.2000 to 18.04.2000.
- Training on instrumentation of turbine and commencement of testing at Kayathar from 07.06.2000 to 19.06.2000
- Training on wind turbine safety and introduction to Load Cases at Chennai from 28.06.2000 to 06.07.2000
- Training on data acquisition system and calibration at Kayathar from 16.08.2000 to 28.08.2000.
- Institutional development programme and training needs assessment at Chennai from 17.08.2000 to 06.09.2000.
- Training on analysis and preparation of test reports and project planning & management at Chennai from 18.11.2000 to 15.12.2000.
- Bridging mission programmes on testing and certification activities at Chennai during the period November 2000 - March 2001.

6.5 The officials of the Centre participated in the following: an appraisal course on "Remote Sensing and GIS" (physics of remote sensing, image processing of remote-sensed data, application of remote sensing and GIS in various fields and information about the software for the above applications) at the National Remote Sensing Agency (NRSA), Hyderabad from 8th to 20th October, 2000; training on variable speed controller and the basic concepts of controller at the Electronic Research and Development Centre of India, Thiruvananthapuram; and Training on structural analysis and design software (STAAD Pro-2000).

6.6 The officials of the Centre participated and made presentations at seminars and symposiums organized by the Confederation of Indian Industry; Tamil Nadu Energy Development Agency; Maulana Azad College of Technology, Anna Institute of Management; and WINDPRO to disseminate information on the activities of the Centre.

7.0 HUMAN RESOURCE DEVELOPMENT, FINANCE & ACCOUNTS

7.1 The Ministry has created 35 posts under different categories of employees as against a total strength of 76 employees as indicated in the Detailed Project Report. Creation of another 11 posts is under process. Human resource development received special attention during the year and employees at various levels were nominated to attend professional training courses, workshops and

seminars. The morale of the employees continued to remain high during the year, facilitating smooth working of the organization and contributing to its achievements.

7.2 The Ministry of Non-Conventional Energy Sources, Government of India, continued to provide support and encouragement for executing various projects and programmes at Centre for Wind Energy Technology. A Corpus Fund has been created out of the internal resources generated by the Centre and the earnings of the Corpus Fund are to be utilized for carrying out various research and development activities, policy studies, providing international assistance etc.

7.3 A Finance Committee has been constituted to review the financial performance, audit and accounting reports, formulate guidelines and procedures for finance and accounts management and for monitoring the operation of the Corpus Fund.

7.4 M/s K. Gnanandandulu & Co., Chartered Accountants, Chennai, were appointed as Auditors to audit the accounts of the Centre for the year 2000-2001 at the Second Annual General Meeting held on 21.09.2000. The accounts of the Centre have been audited as per the provisions of the Tamil Nadu Societies Registration Act, 1975. The audit of accounts has been completed. The Annual Accounts consisting of Balance Sheet as on 31st March 2001, Income and Expenditure Account, Receipts and Payments Account along with Schedules, Notes forming part of accounts and Reports of the Auditors are given in **Appendix VII.**

7.5 An internal audit system has been introduced during the year 2000-2001. In addition to inspection of accounts under Section 14 of Comptroller and Auditor General's (Duties, Powers and Conditions of Service) Act, 1971 by the Accountant General, the Comptroller and Auditor General of India will undertake super-imposed audit of accounts of Centre for Wind Energy Technology in terms of section 20(1) of Comptroller and Auditor General's (Duties, Powers and Conditions of Service) Act, 1971.

8.0 ACKNOWLEDGEMENTS

8.1 The Centre wishes to place on record its appreciation of the valuable contribution made, and the guidance given, by late Shri N.N. Mookerjee and Shri J.N.L. Srivastava during their tenure as Chairmen of the Governing Council and President of the Society.

8.2 The Centre also wishes to place on record the valuable services rendered by Shri P.S. Das, Shri R.N. Srivastava, Shri Anoop Singh, Dr. Vasant Gowariker, Shri T.L. Sankar and Shri R.V.S. Marimuthu as Members of the Governing Council.

8.3 The Centre is grateful to the Ministry of Non-Conventional Energy Sources, the Ministry of Science and Technology and other Ministries/ Departments of Government of India, the Danish International Development Agency, Denmark, M/s RISO National Laboratory, Denmark, the IREDA, the Government of Tamil Nadu, the TNEB, the BIS, the CEA, the NAL, the ER&DCI, the SNAs, the WINDPRO and the IWTMA for their valuable support.

8.4 The Centre also appreciates the valuable services rendered by the employees at all levels during the year.

Appendix- I

DETAILS OF GOVERNING COUNCIL MEMBERS AS ON 31.03.2001		
1	Shri P.M. Nair, Secretary, (Chairman, GC)	Ministry of Non-Conventional Energy Sources, Government of India, New Delhi – 110 003.
2	Shri C.S. Rao, Financial Adviser	Ministry of Non-Conventional Energy Sources, Government of India, New Delhi – 110 003.
3	Shri Ajit K. Gupta, Adviser,Power Group	Ministry of Non-Conventional Energy Sources, Government of India, New Delhi – 110 003.
4	Shri Lal Rawna Sailo, Secretary	Energy Department, Government of Tamil Nadu, Chennai – 600 009.
5	Shri S. Nautiyal, Director General	Bureau of Indian Standards, New Delhi – 110 002.
6	Shri D.V. Khera, Chairman	Central Electricity Authority, New Delhi – 110 066.
7	Dr. V. Bakthavatsalam, Managing Director	Indian Renewable Energy, Development Agency, New Delhi – 110 003.
8	Dr. T.S. Prahlad, Director	National Aerospace Laboratory, Bangalore – 560 017.
9	Dr. V. Siddhartha, Adviser DRDO & OSD	Secretariat of SA to RM, Ministry of Defence, New Delhi - 110 011.
10	Shri V.K. Neelakandhan, Director	Electronics Research & Development Centre of India, Thiruvananthapuram – 695 033.
11	Shri Sarvesh Kumar, Chairman	Indian Wind Turbine Manufacturers Association, Chennai - 600 008.
12	Executive Director, (Member-Secretary)	Centre for Wind Energy Technology, Chennai – 600 101.

Appendix - II

POTENTIAL SITES FOR WIND POWER PROJECTS IN THE COUNTRY AS ON 31.03.2001

Sl. No.	Sl. No.	Station	Latitude °N		Longitude °E		Elevation m.a.s.l.	Annual Mean Wind Speed (KMPH)		Annual Mean Wind Power Density W/m²	
			Deg.	Min.	Deg.	Min.		Measured at 20/25m	Extrapolated at 30m	Measured at 20/25m	Extrapolated at 30m
TAMIL NADU											
1	1	Achankuttam	8	57	77	28	120	18.60	20.00	270	335
2	2	Alagiyapandiyapuram	8	56	77	39	85	20.90	22.30	301	371
3	3	Andhiyur	10	36	77	11	380	19.10	20.60	177	213
4	4	Andipatti	10	0	77	33	320	19.00	19.60	266	298
5	5	Arasampalayam	10	51	77	3	370	20.50	21.80	195	232
6	6	Ayikudy	9	0	77	21	182	21.40	23.50	305	390
7	7	Edayarpalayam	10	55	77	7	445	22.40	23.80	273	323
8	8	Ennore	13	16	80	19	6	19.30	20.80	139	177
9	9	Gangaikondan *	8	51	77	35	60	18.40	19.00	246	267
10	10	Kannankulam *	8	12	77	35	20	21.30	22.20	238	268
11	11	Kattadimalai	8	14	77	33	90	23.70	25.30	312	380
12	12	Kayattar - I	8	58	77	44	94	20.30	21.50	294	342
13	13	Kayattar - II *	8	57	77	43	105	20.50	20.90	285	302
14	14	Kethanur	10	54	77	13	403	21.10	22.30	259	305
15	15	Kumarapuram *	8	16	77	35	80	22.00	22.70	288	315
16	16	Mangalapuram	9	3	77	22	190	22.30	23.40	312	357
17	17	Meenakshipuram	9	52	77	18	290	16.40	17.50	224	267
18	18	Mettukadal	10	52	77	23	348	18.00	19.20	184	221
19	19	Muppandal	8	16	77	33	100	25.50	27.60	406	519
20	20	Myvadi	10	36	77	19	341	19.60	21.00	251	305
21	21	Naduvakkurichi	9	7	77	30	160	16.80	18.00	157	190
22	22	Nettur *	8	54	77	33	100	19.90	20.20	338	358
23	23	Onamkulam *	8	57	77	51	100	19.90	20.30	247	258
24	24	Ottapidaram	8	54	78	1	40	18.50	20.00	221	280
25	25	Ovari	8	18	77	53	39	18.20	19.20	160	184
26	26	Panakudi	8	19	77	33	140	22.90	23.90	366	408
27	27	Pongalur	10	58	77	21	388	19.10	20.40	213	251
28	28	Poolavadi	10	44	77	17	321	21.20	23.00	283	343
29	29	Poosaripatti *	10	40	77	7	380	19.30	20.00	168	188
30	30	Puliyamkulam	8	19	77	44	40	18.90	20.80	188	245

31	31	Rameswaram	9	17	79	20	4	23.90	26.40	290	398
32	32	Sankaneri *	8	12	77	40	28	22.60	23.40	258	287
33	33	Sembagaramanpudur	8	16	77	31	40	21.70	23.00	300	367
34	34	Servallar Hills	8	42	77	21	312	17.80	18.90	207	247
35	35	Sultanpet	10	52	77	11	380	19.00	19.10	203	204
36	36	Talayathu	8	48	77	40	105	20.50	21.50	324	364
37	37	Thannirpandal	10	57	77	19	400	18.20	21.00	216	330
38	38	Tuticorin	8	50	78	8	3	17.60	19.00	148	185
39	39	Vakaikulam	8	45	78	0	39	16.60	17.90	167	201
GUJARAT											
40	1	Adesar	23	33	70	57	41	15.60	18.60	93	156
41	2	Amrapar (GIR)	21	11	70	25	140	19.67	21.29	147	186
42	3	Amrapar (SETH)	21	44	70	3	160	19.17	20.20	151	176
43	4	Bamanbore II	22	26	71	3	200	20.30	21.50	171	199
44	5	Bayath	22	56	69	11	20	17.65	20.06	118	179
45	6	Bhandariya	22	6	69	43	106	19.50	20.40	162	180
46	7	Dhank I	21	48	70	8	175	24.40	25.50	312	353
47	8	Dhank II	21	48	70	7	208	25.10	25.50	327	344
48	9	Gala	22	19	70	5	95	19.76	21.06	175	205
49	10	Godladhar	22	3	71	20	242	19.45	22.50	144	216
50	11	Haripar	22	16	69	38	40	20.06	21.19	160	186
51	12	Harshad	21	50	69	22	12	20.00	21.40	164	193
52	13	Jafrabad	20	54	71	24	20	17.50	19.10	137	176
53	14	Jamanvada	23	35	68	36	57	18.60	20.70	149	202
54	15	Kalyanpur	22	3	69	24	80	22.10	23.70	208	253
55	16	Kera	23	4	69	36	120	19.42	20.41	135	156
56	17	Khambada	21	22	71	8	180	17.50	19.10	126	155
57	18	Kukma	23	11	69	47	205	19.20	20.60	150	184
58	19	Lamba	21	54	69	19	20	20.00	21.10	164	191
59	20	Limbara	22	32	70	59	160	19.10	20.10	166	190
60	21	Mahidad	22	13	71	8	250	21.50	22.10	178	190
61	22	Mesaria	22	28	71	6	200	18.78	19.91	131	154
62	23	Motisindholi	23	11	68	43	4	17.50	20.40	118	180
63	24	Mundra	22	47	69	43	2	19.50	21.30	168	217
64	25	Navadra	21	57	69	16	24	20.80	22.40	183	226
65	26	Nani Kundal	21	55	71	28	154	20.03	21.90	163	209
66	27	Navibander	21	26	69	47	10	19.50	20.50	153	176
67	28	Okha	22	27	69	3	1	19.40	20.60	150	191

68	29	Okhamadhi	22	6	69	6	12	19.00	20.20	129	159
69	30	Poladiya	23	6	69	12	120	20.36	22.00	174	215
70	31	Ratabhe	22	56	71	2	70	17.50	19.40	123	154
71	32	Roman	22	1	71	28	140	17.10	20.00	123	172
72	33	Sanodar	21	35	72	11	80	22.46	24.19	197	254
73	34	Sinaji	23	3	70	4	57	20.78	21.84	183	207
74	35	Suvarda	22	23	70	7	90	20.20	21.50	166	196
75	36	Surajbari	23	14	70	39	9	19.50	22.00	184	268
ORISSA											
76	1	Chandipur	21	32	87	1	5	15.18	18.50	120	179
77	2	Chatrapur	19	18	84	58	9	14.40	16.50	106	158
78	3	Damanjodi	18	49	83	0	1325	18.63	19.98	150	187
79	4	Gopalpur	19	16	84	54	7	16.20	18.10	124	173
80	5	Paradwip	20	23	86	41	6	18.20	20.10	153	201
81	6	Puri	19	48	85	49	2	17.50	18.80	137	166
MAHARASHTRA											
82	1	Alamprabhu Pathar *	16	46	74	22	790	20.50	21.10	164	178
83	2	Amberi	17	36	74	19	960	23.00	23.40	237	246
84	3	Brahmanwel	21	10	74	11	600	23.10	23.60	278	289
85	4	Chakla	21	19	74	19	380	23.70	24.60	242	270
86	5	Chalkewadi	17	36	73	49	1160	20.20	20.60	206	211
87	6	Dhalgaon	17	8	74	59	810	21.20	21.90	216	234
88	7	Dongerwadi	16	55	74	48	820	20.07	21.06	167	190
89	8	Gawalwadi	20	6	73	43	740	18.00	19.60	127	164
90	9	Gude Panchagani	17	7	73	59	903	19.80	21.30	178	223
91	10	Kamravad	21	35	74	45	300	18.10	18.70	141	152
92	11	Kas	17	44	73	49	1240	19.50	20.20	173	189
93	12	Kavadya Donger	19	1	74	32	910	22.80	23.30	219	233
94	13	Khandke	19	8	74	53	920	19.60	21.30	146	187
95	14	Kolgaon *	18	50	74	43	800	20.50	21.00	177	190
96	15	Kotholi	16	58	73	59	780	17.80	18.10	164	171
97	16	Lonavla	18	47	73	23	560	15.50	17.70	122	176
98	17	Mander Deo	18	2	73	53	1260	19.40	19.80	153	163
99	18	Matrewadi *	17	12	73	56	898	20.80	21.10	211	218
100	19	Motha	21	24	77	21	1075	18.70	19.10	146	154
101	20	Panchagani	17	55	73	48	1372	18.40	19.70	133	160
102	21	Raipur	21	2	74	22	500	18.90	19.50	162	173
103	22	Sautada *	18	48	75	20	800	21.20	21.90	167	182

104	23	Takar Mouli	21	3	73	58	600	20.80	21.10	186	195
105	24	Thoseghar	17	35	73	53	1140	21.70	23.30	229	287
106	25	Vijayadurg	16	30	73	20	100	19.60	20.60	207	225
107	26	Vankusawade *	17	27	73	50	1100	21.20	21.70	231	247
108	27	Varekarwadi	17	13	73	59	920	21.04	21.50	257	264
ANDHRA PRADESH											
109	1	Badhrampalli Kottala *	14	55	77	24	440	21.30	21.50	248	255
110	2	Bhimunipatnam	17	54	83	27	100	19.10	20.10	195	229
111	3	Banderlapalli *	15	1	78	4	438	20.79	21.60	240	265
112	4	Borampalli *	14	30	77	9	550	19.40	20.00	163	176
113	5	Burugula *	15	8	77	57	540	18.40	19.10	147	163
114	6	Chinnababaiyapalli *	13	57	77	37	750	18.50	19.90	132	171
115	7	Jamalamadugu I *	14	49	78	23	195	17.50	18.30	161	184
116	8	Jamalamadugu II *	14	46	78	22	220	18.60	19.40	165	183
117	9	Jangamguntla	15	39	79	8	300	16.03	16.60	149	164
118	10	Kadavakallu *	14	48	77	56	340	22.10	22.30	303	308
119	11	Kakulakonda	13	43	79	21	981	23.10	25.00	332	404
120	12	Kondamithipalli *	15	3	78	3	440	21.22	22.00	252	282
121	13	Lachambavi	16	27	79	19	280	15.40	17.90	98	150
122	14	Madugupalli *	14	42	77	51	440	19.30	20.10	169	187
123	15	M.P.R. Dam	14	54	77	25	450	19.90	20.70	228	245
124	16	Mustikovala	14	15	77	32	600	20.20	20.80	201	216
125	17	Nallakonda *	14	7	77	34	757	22.80	23.10	276	288
126	18	Narasimhakonda	14	30	79	52	100	20.10	22.50	186	261
127	19	Nazeerabad *	17	11	77	55	664	21.00	21.60	176	189
128	20	Pampanoor Thanda *	14	38	77	24	490	19.60	20.10	182	194
129	21	Payalakuntla	14	53	79	2	340	20.10	20.40	230	241
130	22	Puttaparthy *	14	9	77	48	540	17.70	18.00	149	156
131	23	Ramagiri – I	14	17	77	31	667	19.50	20.90	205	246
132	24	Ramagiri III	14	22	77	32	550	19.40	20.20	190	213
133	25	Singanamala	14	46	77	44	469	23.80	24.20	366	377
134	26	Tallimadugula *	14	22	77	32	540	22.20	22.50	260	267
135	27	Talaricheruvu *	14	57	78	3	360	18.11	19.30	144	179
136	28	Tirumala	13	40	79	22	880	20.40	21.90	226	282
137	29	Tirumalayapalli	14	54	78	11	451	19.00	20.80	154	195
138	30	Vajrakarur	14	58	77	19	507	19.46	20.90	173	205
RAJASTHAN											
139	1	Devgarh *	24	3	74	39	520	19.88	21.36	151	186

140	2	Damotar	24	7	74	44	540	18.80	19.50	149	163
141	3	Harshnath *	27	30	75	10	910	20.62	22.60	206	277
142	4	Jaisalmer	26	54	70	55	231	17.80	19.50	159	202
143	5	Jaswanthgad	24	47	73	28	940	18.90	19.40	142	152
144	6	Khodal	26	22	71	13	200	17.00	18.50	135	170
145	7	Mohangarh	27	17	71	13	155	15.50	17.50	117	161
146	8	Phalodi	27	7	72	20	260	17.40	19.20	142	185
LAKSHADWEEP											
147	1	Agathi	10	51	72	11	1	18.40	19.50	179	208
148	2	Amini	11	7	72	44	4	17.40	-	140	>150
149	3	Bitra	11	35	72	12	4	16.50	19.30	173	258
150	4	Chetlat	11	43	72	43	4	19.00	20.04	172	205
151	5	Kadmat	11	13	72	47	1	18.00	19.40	169	211
152	6	Kalpeni	10	5	73	39	1	16.20	18.90	125	182
153	7	Kavarathi	10	32	72	38	1	18.00	19.60	161	206
154	8	Minicoy	8	17	73	4	1	17.40	>17.4	162	>162
KARNATAKA											
155	1	B.B. Hills	13	26	75	45	1768	26.80	27.60	498	532
156	2	Bommanahalli	13	17	76	36	940	18.10	19.40	128	151
157	3	Chalamatti	15	18	75	3	710	21.40	22.90	189	230
158	4	Chikodi *	16	25	74	35	769	23.20	23.50	264	272
159	5	Godekere *	13	20	76	40	978	19.80	19.90	155	157
160	6	Gokak	16	7	74	47	775	19.20	21.40	168	228
161	7	Hanamsagar	15	54	76	2	719	20.60	22.10	173	210
162	8	Hanumanahatti	15	55	74	43	902	20.30	22.10	165	213
163	9	Horti *	17	7	75	44	620	19.80	20.10	173	180
164	10	Haradenahalli	12	51	76	13	1030	18.50	19.70	127	151
165	11	Jogimatti	14	10	76	24	1120	30.30	31.30	498	553
166	12	Khanderayanahalli *	14	30	75	45	629	20.20	20.30	183	185
167	13	Khamkarhatti *	15	45	74	35	863	20.30	20.80	159	169
168	14	Malgatti	15	49	75	54	680	19.60	21.90	156	219
169	15	Mannikere	15	58	74	28	925	24.30	25.20	252	278
170	16	Mavinhunda	16	25	74	48	787	22.13	-	212	>212
171	17	Sangundi	16	15	75	44	625	18.70	20.40	153	193
172	18	Somadevarahatti	16	53	75	31	620	17.50	18.70	131	155
173	19	Arasinagundi	14	29	76	50		-	27.00	-	392
174	20	Bullenahalli 1	13	25	76	41		-	21.20	-	168
175	21	Bullenahalli 2	13	24	76	41		-	20.34	-	195

176	22	Gujanur	14	58	75	54		-	23.35	-	240
177	23	ogimatti	14	11	76	25		-	31.03	-	582
178	24	Madikaripura	14	13	76	27		-	27.13	-	365
179	25	Sogi A	14	55	75	59		-	26.56	-	415
180	26	Sogi B	14	54	75	59		-	24.48	-	271
KERALA											
181	1	Kanjicode	10	47	76	49	130	22.60	23.70	218	249
182	2	Kailasammedu	9	51	77	10	1160	23.20	24.50	251	300
183	3	Kolahalamedu	9	40	76	56	1000	16.90	17.80	146	174
184	4	Kottamala	10	40	76	36	150	19.20	20.50	154	187
185	5	Kottathara	11	7	76	39	750	19.70	20.70	207	243
186	6	Kulathummedu	9	44	77	13	1040	19.09	22.02	180	239
187	7	Kuttikanam	9	35	76	59	1000	16.50	18.00	140	181
188	8	Nallasingam	11	6	76	44	840	22.90	24.10	324	377
189	9	Panchalimedu	9	32	76	57	950	20.20	20.90	258	265
190	10	Parampukottimedu	9	54	77	12	1160	26.40	28.40	447	525
191	11	Ponmudi	8	46	77	8	1074	18.50	18.70	216	220
192	12	Pullikanam	9	44	76	52	1100	18.20	18.50	178	187
193	13	Ramakalmedu	9	49	77	14	920	29.70	29.70	532	534
194	14	Senapathi	9	57	77	11	1240	19.30	20.70	192	233
195	15	Sakkulathumedu	9	52	77	13	1040	28.55	28.63	531	533
196	16	Tolanur	10	42	76	30	100	15.70	17.20	115	157
MADHYA PRADESH											
197	1	Jamgodrani	22	59	76	10	560	18.20	19.70	130	164
198	2	Kheda	22	36	75	38	618	18.50	19.70	126	152
199	3	Kukru	21	30	77	28	1118	19.00	20.40	157	194
200	4	Mahuria *	23	50	76	6	504	19.00	19.50	171	181
201	5	Mamatkheda	23	45	75	3	560	20.04	21.49	169	202
202	6	Nagda *	22	53	76	3	700	22.50	23.50	219	249
203	7	Sendhwa	21	38	75	3	540	18.10	19.10	163	183
204	8	Valiyarpani	21	39	74	57	505	18.50	19.80	179	215
WEST BENGAL											
205	1	Fraserganj *	21	34	88	15	3	17.70	18.25	147	158
206	2	Ganga Sagar *	21	37	88	4	3	17.40	18.10	155	173
ANDAMAN & NICOBAR ISLANDS											
207	1	Keating Point	9	15	92	46	2	16.06	19.01	114	175
UTTARANCHAL											
208	1	Bachelikhal	30	4	78	37	945	18.06	20.01	144	181

Note: * 25 m mast; Sorial No. 19 to 26 in Karnataka with 30 m mast (KPCL & NAL mast)

Appendix – III

ESTIMATED POTENTIAL OF WIND ENERGY (WPD Range >150 W/m2 C.F 13%)					
Sl. No	State& Station	No.of Sites	30 m agl.	40 m agl.	50 m agl.
			In MW		
I	TAMIL NADU				
1	Edayarpalayam	10	187.6	187.6	187.5
2	Andipatti	6	349.1	349.0	350.7
3	Alagiapandiapuram	9	386.8	386.7	386.7
4	Maivadi	5	237.3	237.3	237.2
5	Onamakulam	3	464.2	464.2	464.2
6	Pongalur	6	156.7	156.7	156.7
7	Poolvadi	6	296.5	296.5	296.5
8	Pusarippatti	3	314.4	314.3	314.3
9	Ottapidaram	8	168.2	168.2	168.2
10	Ovari	3	209.3	211.7	211.7
11	Puliyamkulam	3	573.7	573.7	573.7
12	Sankaneri	3	172.2	172.2	172.2
13	Ennur	1	59.1	59.1	59.1
14	Ayikudi	3	205.3	205.5	205.4
15	Naduvakkurichi	3	77.9	77.9	77.9
16	Achankuttam	3	147.2	147.2	147.2
	TOTAL	**75**	**4005.5**	**4007.8**	**4009.2**
II	GUJARAT				
17	Jafrabad	8	137.1	228.2	255.3
18	Okha	17	219.0	268.2	277.8
19	Jamanvada	10	1100.0	1100.3	1100.2
20	Mundra	9	179.4	403.3	630.3
21	Motisndholi	11	663.0	790.4	857.4
22	Bamanbore	10	686.5	690.2	690.3
23	Dhank	9	491.5	496.6	497.1
24	Kukma	15	394.0	414.9	414.8
25	Sanodar	9	174.6	487.3	497.1
26	Navibander	2	-	18.8	34.1

27	Surajbari	18	563.5	563.5	563.6
28	Bhandariya	9	441.6	447.6	447.6
29	Haripar	9	42.9	307.5	311.2
30	Amrapur	10	-	294.0	375.2
31	Kalyanpur	9	432.4	433.8	433.8
	TOTAL	**155**	**5525.5**	**6944.6**	**7385.8**
III	**ANDHRA PRADESH**				
32	Jamalamadugu	9	38.0	38.4	39.0
33	Kadavakallu	8	29.0	30.1	30.2
34	Kondamedepalli	14	48.7	58.0	59.3
35	Nallakonda	6	31.2	38.9	57.6
36	Ramagiri	10	32.2	31.9	32.8
37	Pampanoor Tanda	6	10.5	14.5	14.5
38	MPR Dam	6	19.7	50.9	50.9
39	Nazirabad	6	1.9	1.9	9.7
40	Bhimunipatanam	6	27.8	31.7	32.7
	TOTAL	**71**	**239.0**	**296.3**	**326.7**
IV	**KARNATAKA**				
41	Chikkodi	9	29.0	29.0	29.0
42	Joggimatti	10	107.3	262.6	286.7
43	Hanamsagar	3	7.4	15.4	15.7
44	Horti	9	11.6	18.3	44.5
45	Gogak	7	9.5	11.6	27.7
46	Sangundi	3	17.9	17.9	17.9
47	Khanderayanahalli	2	8.3	13.0	16.1
48	Khamkarkatti	4	28.2	56.0	95.0
49	Hanumankatti	2	61.2	61.1	61.0
50	B.B.Hills	2	22.5	22.5	22.6
51	Chalamatti	1	15.2	15.2	15.2
52	Kappata Hills	3	369.9	368.6	372.2
	TOTAL	**55**	**688.0**	**891.2**	**1003.6**
V	**MADHYA PRADESH**				
53	Kukru	13	37.0	41.0	55.0
54	Mahuria	11	13.0	37.8	56.0
55	Sendhwa	16	6.0	18.7	37.0
	TOTAL	**40**	**56.0**	**97.5**	**148.0**

VI	**MAHARASHTRA**				
56	Alamprabhupathar	5	10.2	13.9	15.6
57	Dhalagaon	13	45.4	78.7	107.1
58	Gude Panchggani	11	82.5	90.0	97.8
59	Khandkha	11	82.8	108.2	144.2
60	Kolgaon	26	53.3	81.9	152.6
61	Kotoli	16	53.0	69.5	94.2
62	Lonavale	10	11.6	15.4	19.1
63	Matrewadi	11	72.9	82.5	89.7
64	Motha	7	20.4	32'5	55.9
65	Sauthada	7	40.0	69.5	139.5
66	Vankusavade	9	73.8	92.6	116.6
67	Vijayadurg	5	16.6	27.1	78.4
68	Thoseghar	10	86.3	89.5	89.5
	TOTAL	**141**	**648.8**	**851.3**	**1200.2**
VII	**RAJASTHAN**				
69	Jaisalmer	4	70.0	70.0	70.0
70	Devagarh	12	10.0	94.8	138.0
71	Phalodi	3	126.0	126.0	126.0
	TOTAL	**19**	**206.0**	**290.8**	**334.0**
VIII	**WEST BENGAL**				
72	Ganga Sagar	11	22.0	55.0	114.0
IX	**ORISSA**				
73	Damanjodi	11	60.0	70.0	75.0
74	Puri	8	17.0	19.0	24.0
	TOTAL	**19**	**77.0**	**89.0**	**99.0**
X	**KERALA**				
75	Kanjikkode	4	285.3	285.2	285.0
	TOTAL	**4**	**285.3**	**285.2**	**285.0**
	GRAND TOTAL	**590**	**11753.1**	**13808.7**	**14906.0**

Appendix - IV

MEMBERS OF RESEARCH AND DEVELOPMENT COUNCIL		
1	Dr. V. Siddhartha, Adviser DRDO & OSD (Chairman, RC)	Secretariat of SA to RM, Ministry of Defence New Delhi - 110 011.
2	Shri Ajit K. Gupta, Adviser, Power Group	Ministry of Non-Conventional Energy Sources, Government of India, New Delhi – 110 003.
3	Dr. R.V. Krishnan, Head, Materials Science Dn. & Adviser (Mgt. & Admn.)	National Aerospace Laboratories, Viman-Pura (Kodihally), Bangalore - 560 017.
4	Prof. Sujay Basu, Director	School of Energy Studies, Jadavpur University, Kolkatta - 700 032.
5	Dr. K.A. Fathima, Additional Director & Head, Power Electronic Groups	Electronics Research and Development Centre of India, Thiruvananthapuram - 695 033.
6	Shri. J. Shanmugasundram, Asst.Director (Wind Engineering)	Structural Engineering Research Centre, CSIR Campus, Taramani, Chennai - 600 113.
7	Dr. S. Rangarajan, Wind Energy Expert	A-41, Industrial Estate II stage, Peenya, Bangalore - 560 058.
8	Shri. L.E. D'Cruz, Wind Energy Consultant	Enercon (India) Ltd., Andheri (West) Mumbai - 400 053.
9	Dr. R.P. Gupta, Wind Energy Expert	Centre for Energy Technology, Osmania University, Hyderabad - 500 007.
10	Executive Director	Centre for Wind Energy Technology, Chennai – 600 101.
11	Shri. N.S. Prasad, Unit Chief (Secretary, RC)	Centre for Wind Energy Technology, Chennai – 600 101.

Appendix-V

TERMS OF REFERENCE TO RC AND GENERIC AREAS OF R&D ACTIVITIES		
Terms of Reference		
1.	Guide the formulation of the Research, Development, Test and Evaluation (RDT&E) programmes/projects of the Centre, and approve them.	
2.	Recommend the annual and rolling 5-year budget of RDT&E activities of C-WET for approval by the Governing Council.	
3.	Guide the establishment of the inter-linkages and networking of C-WET with other R&D institutions, laboratories and academic bodies as necessary to implement the approved RDT&E programmes of C-WET.	
4.	Closely monitor and review the implementation of each RDT&E project, and report progress periodically to Governing Council.	
5.	Any other functions as may be assigned to the RC by the Governing Council from time-to-time.	
GENERIC AREAS OF RESEARCH & DEVELOPMENT		
1.	**Wind Resource Assessment and related studies.**	
	A.	Wind Atlas, and Modeling therefore
	B.	Feasibility of Off-shore Wind Power
	C.	Other studies (eg. Kargil, GIS)
2.	**Improvement in the performance of existing grid connected wind turbine installations.**	
	A.	Optimal Blade Angle studies
	B.	Failure analysis of Gear-boxes
	C.	Development of Advanced Static Var Compensator
	D.	Grid related investigations
	E.	Operation and Maintenance (eg. Corrosion, Lighting protection)
3.	**Wind-Diesel Systems for off-grid areas.**	
	A.	Development of prototype of Wind Diesel Hybrid System
	B.	Feasibility of deployment in Andaman & Nicobar Islands
4.	**Technology Support to Wind Power Industry and Manpower Training.**	
	Wind Power System performance evaluation facilities and Technology Demonstration Wind Farms	
5.	**Research and Advanced Technology Development.**	
	Such as: Blade Design and Development	

Appendix - VI

MEMBERS OF STEERING COMMITTEE		
1	Shri P.M. Nair, Secretary, (Chairman, SC)	Ministry of Non-Conventional Energy Sources, Government of India, New Delhi – 110 003.
2	Shri C.S. Rao, Financial Adviser	Ministry of Non-Conventional Energy Sources, Government of India, New Delhi – 110 003.
3	Shri Ajit K. Gupta, Adviser,Power Group	Ministry of Non-Conventional Energy Sources, Government of India, New Delhi – 110 003.
4	Shri R. Satapathy Chairman & Mg. Director	Tamil Nadu Energy Development Agency, Chennai – 600 006
5	Representative of DANIDA	Royal Danish Embassy, New Delhi - 110 011.
6	Danish Technical Consultant for the Project	RISO National Laboratory, Denmark.
7	Danish Project Monitoring Consultant for the Project	L&T Ramboll, Denmark / Chennai.
8	Dr. V. Bakthavatsalam Managing Director	Indian Renewable Energy Development Agency, New Delhi – 110 003.
9	Deputy Director-General	Bureau of Indian Standards, New Delhi – 110 002.
10	Prof. Sujay Basu, Director	School of Energy Studies, Jadavpur University, Kolkatta – 700 032.
11	Shri Sarvesh Kumar Chairman	Indian Wind Turbine Manufacturers Association, Chennai – 600 008.
12	Shri K. Kasthuri Rangaian Hon. Secretary	Wind Power Producers Association, Chennai – 600 004.
13	Executive Director (Member-Secretary)	Centre for Wind Energy Technology, Chennai – 600 101.

Founder (Late)
K. GNANANANDULU, G.D.A.F.C.A
Managing Partner
K. NARASIMHAM, BA., F.C.A.
Managers:
K. RAMAKRISHNA
K. RAVISHANKAR

K. Gnananandulu & Co.,
CHARTERED ACCOUNTANTS
682, MOUNT ROAD,
MADRAS – 600 006.

Phone 852 50 67
Res 434 25 23
434 19 57
Residence:
20.21, Madley Road,
T.Nagar,
Madras – 600 017.

AUDITORS REPORT

Appendix - VII

To

The Governing Council,
Centre for Wind Energy Technology,
R-8, North Main Road,
Anna Nagar West Extension,
Chennai - 600 101.

We have audited the attached Balance Sheet of Centre for Wind Energy Technology as at 31st March 2001, Receipts and Payments Account and Income and Expenditure Account for the year ended as on that date along with notes on accounts annexed there to. As required by the Tamil Nadu Societies Registration Act, 1975 and Tamil Nadu Societies Registration Rules, 1978, we report that:

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 the 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.
4. 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 accounting policies and notes thereon, give the information required by the Tamil Nadu Societies Registration Act, 1975 and Tamil Nadu Societies Registration Rules, 1978, in the manner so required and give a true and fair view:

   (i) In the case of the Balance Sheet, of the state of affairs of the Centre for Wind Energy Technology as at 31st March 2001

   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.

For **K.Gnananandulu & Co.,**
Chartered Accountants

Place : Chennai.
Date : 13.08.2001

(K.NARASIMHAM)
Partner.

Founder (Late)
K. GNANANANDULU, G.D.A.F.C.A
Managing Partner
K. NARASIMHAM, BA., F.C.A.
Managers:
K. RAMAKRISHNA
K. RAVISHANKAR

K. Gnananandulu & Co.,
CHARTERED ACCOUNTANTS
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ANNEXURE TO THE AUDITORS REPORT

1. The Centre for Wind Energy Technology has maintained proper records showing full particulars including quantitative details and situation of fixed assets. The said fixed assets have been verified by the management at the end of the year. No material discrepancies have been noticed on such physical verification. None of the assets have been revalued during the year.
2. As per the information furnished, the Centre for Wind Energy Technology has not taken any loans, secured or unsecured from companies, firms or other parties. No Mortgage or Charge has been created on the Assets of Centre for Wind Energy Technology.
3. As per the information furnished, the Centre for Wind Energy Technology has not given any loans, secured or unsecured to companies, firms or other parties. No loan / advance in the nature of loans other than advance to staff and advance to Wind Resource Assessment Project have been given by the Centre for Wind Energy Technology. The said advances are free from interest.
4. In our opinion and according to the information and explanations given to us, there are adequate internal control procedures commensurate with the size and the nature of its operation with respect to purchase of instruments, equipment and other assets.
5. A firm of Chartered Accountants has conducted the Internal Audit of the Centre for Wind Energy Technology and taking into consideration the size and nature of its business; the scope and coverage are considered adequate.
6. The Centre for Wind Energy Technology has been generally regular in depositing statutory dues with the appropriate authorities.
7. As per the records of the Centre for Wind Energy Technology and the information and explanations given to us, no personal expenses have been charged to Revenue Account other than those payable under contractual obligation or in accordance with generally accepted practice.

For **K.Gnananandulu & Co.,**
Chartered Accountants

Place : Chennai.
Date : 13.08.2001

(K.NARASIMHAM)
Partner.

BALANCE SHEET AS AT 31ST March 2001

(Value in Rs.)

	Source of Funds	Schedule No.	As at 31.03.2001	As at 31.03.2000
1	Capital Fund	1	37,114,835	20,806,957
2	Corpus Fund		1,990,199	-
	Total		**39,105,034**	**20,806,957**
	Application of Funds			
1	Fixed Assets:			
	Gross Block	4	19,750,505	10,384,971
	Less: Depreciation		1,671,497	582,765
	Net Block		18,079,008	9,802,206
	Add: Capital Work in Progress		0	2,110,116
			18,079,008	**11,912,322**
2	Current Assets:			
	Cash and Bank Balance	2	8,344,474	4,192,854
	Loans and Advances	3	613,154	407,395
			8,957,628	4,600,249
	Less: Current Liabilities	6	2,493,592	1,686,488
	Net Current Assets		**6,464,036**	**2,913,761**
3	Deferred Revenue Expenditure to the extent not written off	5	**470,906**	**138,337**
4	Excess of Expenditure over Income (Balance carried from Income and Expenditure Account)		**14,091,084**	**5,842,537**
	Total		**39,105,034**	**20,806,957**
	Notes on Accounts	13		

For Centre for Wind Energy Technology

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

A. Jayaraman
General Manager (F&A)

K.J. Sundararajamoorthy
Special Officer (Cdn.)

K. NARASIMHAM
Partner

Ajit K. Gupta
Executive Director

P.M. Nair
President / Chairman

Place : Chennai
Date : 13.08.2001

INCOME AND EXPENDITURE ACCOUNT
FOR THE YEAR ENDED 31.03.2001

	Schedule No.	Current Year	Previous Year
Income:			
Fees from Services	7	1,750,000	-
Other Income	8	586,058	379,866
Total		**2,336,058**	**379,866**
Expenditure:			
Employees Remuneration	9	3,732,279	2,335,431
Travel & conveyance	10	941,284	979,313
Project Expenses	11	490,955	118,699
Administration and Other Expenses	12	1,982,924	1,593,110
Depreciation	5	1,088,732	582,407
Deferred Revenue expenditure written off	4	177,543	50,015
Total		**8,413,717**	**5,658,975**
Excess of Expenditure over Income		**6,077,659**	**5,279,109**
Prior period expenses		180,689	-
Corpus Fund carried to Balance Sheet		1,990,199	-
Balance brought forward from previous year		5,842,537	563,428
Balance carried to Balance Sheet		**14,091,084**	**5,842,537**
Notes on Accounts	13		

For Centre for Wind Energy Technology

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

A. Jayaraman
General Manager (F&A)

K.J. Sundararajamoorthy
Special Officer (Cdn.)

K. NARASIMHAM
Partner

Ajit K. Gupta
Executive Director

P.M. Nair
President / Chairman

Place: Chennai
Date: 13.08.2001

RECEIPTS AND PAYMENTS ACCOUNT FOR THE YEAR ENDED 31ST MARCH 2001

(Value in Rs.)

	Current Year	Previous Year
I. Opening Balance	**4,192,854**	**7,193,639**
II. Receipts		
Grants-in-aid for C-WET	12,460,000	5,000,000
Grants-in-aid for WRA Projects	3,475,000	6,100,000
Fees for services	1,750,000	-
Fees received in advance	832,415	643,050
Other income	586,058	379,866
Other receipts	101,725	50,212
Total Receipts	**19,205,198**	**12,173,128**
Total funds available (I + II)	**23,398,052**	**1,93,66,767**
III. Payments		
(a) For C-WET		
Employees Remuneration	3,539,645	2,091,525
Travel and Conveyance	920,797	986,773
Administration and Other Expenses	2,150,380	1,540,434
Project expenses	317,414	118,699
Deposit & Advance	307,484	79,443
Capital Expenditure	3,394,366	2,357,764
Capital work in progress	-	2,087,453
Deferred Revenue Expenditure	508,921	151,823
Total	**11,139,007**	**9,413,914**
(b) For Other Projects		
WESP Account (balance amount)	-	101,725
Expenditure on WRA Projects	3,849,663	5,498,275
Expenditure on Consultancy Project	15,483	159,999
Refund of Security Deposit	49,425	-
Total	**3,914,571**	**5,759,999**
Total Payments III (a) + III (b)	**15,053,578**	**15,173,913**
IV. Closing Balance		
Bank Balance - Current Account	5,743,304	4,192,839
Corpus Fund Deposit Account	2,600,000	-
Stamps on hand	1,170	15

For Centre for Wind Energy Technology

A. Jayaraman
General Manager (F&A)

K.J. Sundararajamoorthy
Special Officer (Cdn.)

Ajit K. Gupta
Executive Director

P.M. Nair
President / Chairman

Place: Chennai
Date: 13.08.2001

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

K. NARASIMHAM
Partner

Schedule 1: Capital fund:

(Value in Rs.)

	As at 31.03.2001	As at 31.03.2000
Grants-in-aid from Govt. of India	25,460,000	13,000,000
Instruments and Equipment received from DANIDA /RISO, free of cost	5,932,922	2,085,044
Assets taken over from WESP (IITM-FRU), Bangalore as per order of MNES, Govt. of India.	5,721,913	5,721,913
Total	**37,114,835**	**20,806,957**

Schedule 2: Cash and Bank Balance :

	As at 31.03.2001	As at 31.03.2000
Cash on hand	Nil	Nil
Stamps on hand	1,170	15
Balance with scheduled bank on:		
Current account	5,743,304	4,192,839
Term Deposit (Corpus fund)	2,600,000	-
Total	**8,344,474**	**4,192,854**

Schedule 3: Loans and Advances:

	As at 31.03.2001	As at 31.03.2000
Imprest Advance	-	2,401
Rent advance	231,750	198,000
Advance for Diesel	461	3,594
Advance to Staff	-	21,275
Advance to WRA Projects	676	101,725
Other Advances	20,990	-
Telephone deposit	36,200	21,000
Security deposit	17,200	18,150
Tax Deducted at Source	130,496	33,825
Prepaid Expenses	18,884	-
Due from MNES	126,651	-
Interest accrued on Corpus Fund Deposit	1,496	-
Others: Stock of Stationery	28,350	7,425
Total	**613,154**	**407,395**

Schedule 4: Fixed Assets:

(Value in Rs.)

Description of Assets	Gross block			Depreciation			NET BLOCK	
	As on 31.03.2000	Additions	As on 31.03.2001	Upto 31.03.2000	2000-2001	Upto 31.03.2001	As on 31.03.2001	As on 31.03.2000
C-WET, Chennai								
Furniture & Fittings	447,239	371,882	819,121	19,210	37,425	56,635	762,486	428,029
Instruments and Equipment	1,049,612	163,735	1,213,347	22,410	52,847	75,257	1,138,090	1,027,202
Computer	429,450	1,215,298	1,644,748	28,845	116,325	145,170	1,499,578	400,605
Vehicles	488,543	-	488,543	34,929	46,364	81,293	407,250	453,614
Total	**2,414,844**	**1,750,915**	**4,165,759**	**105,394**	**252,961**	**358,355**	**3,807,404**	**2,309,450**
WTTS, Kayathar								
Land	163,170	-	163,170	-	-	-	163,170	163,170
Other Assets	-	3,766,741	3,766,741	-	100,971	100,971	3,665,770	-
Instruments from DANIDA free of cost	2,085,044	3,847,878	5,932,922	-	-	-	5,932,922	2,085,044
Total	**2,248,214**	**7,614,619**	**9,862,833**	**-**	**100,971**	**100,971**	**9,761,862**	**2,248,214**
WRAP, Bangalore								
Instruments & Other Assets	5,721,913	-	5,721,913	477,371	734,800	1,212,171	4,509,742	5,244,542
Total	**5,721,913**	**-**	**5,721,913**	**477,371**	**734,800**	**1,212,171**	**4,509,742**	**5,244,542**
Capital work in progress	2,110,116	-	-	-	-	-	-	2,110,116
Total	**12,495,087**	**9,365,534**	**19,750,505**	**582,765**	**1,088,732**	**1,671,497**	**18,079,008**	**11,912,322**
Previous year figures	**3,096,215**	**9,398,872**	**12,495,087**	**358**	**582,407**	**582,765**	**11,912,322**	

Schedule 5: Deferred Revenue Expenditure

(Value in Rs.)

	As at 31.03.2001	As at 31.03.2000
Partition and other works	138,337	35,119
Add : Additions during the year	510,112	153,233
Less : Written off during the year	177,543	50,015
Total	**470,906**	**138,337**

Schedule 6: Current liabilities:

	As at 31.03.2001	As at 31.03.2000
Liabilities for expenses	598,959	353,702
Income Tax deducted at source	7,159	9,211
Salary recoveries	28,248	37,643
Security deposit	13,440	62,865
Liabilities to suppliers	118,831	104,466
Balance of Grants-in-Aid for Projects	227,062	601,725
Fees received in- advance	1,499,893	516,876
Total	**2,493,592**	**1,686,488**

Schedule 7: Fees for Services:

	Current Year	Previous Year
Fees for Testing	1,420,000	-
Fees for Wind Resources Assessment	330,000	-
Total	**1,750,000**	**-**

Schedule 8: Other Income:

Interest on Term Deposits with Bank	309,247	291,506
Sale of Books / Data	272,500	-
Other Income	4,311	88,360
Total	**586,058**	**379,866**

Schedule 9: Employees Remuneration:

	Current Year	Previous Year
Salaries & Allowances	3,268,236	1,901,013
Wages & labour charges	256,317	250,905
Contribution to Provident Fund	58,181	86,897
Contribution to Pension & Gratuity	73,122	80,762
Medical Reimbursement	31,208	5,041
Staff Welfare expense	21,625	10,813
Bonus & Ex-gratia	23,590	-
Total	**3,732,279**	**2,335,431**

(Value in Rs.)

Schedule 10: Travel & Conveyance:

	Current Year	Previous Year
Travel & conveyance	819,437	881,361
Taxi hire charges	121,847	97,952
Total	**941,284**	**979,313**

Schedule 11: Project Expenses:

	Current Year	Previous Year
WTTS Expenses	319,870	-
Field Testing Expenses	-	118,699
Consultancy Projects	171,085	-
Total	**490,955**	**118,699**

Schedule 12: Administration and other expenses:

	Current Year	Previous Year
Rent for Office Building	420,300	353,700
Meeting and Seminar expenses	77,182	157,022
Electricity charges	90,666	77,953
Vehicle Maintenance	85,189	70,964
Guesthouse Maintenance	97,730	111,965
Postage & Courier charges	45,330	23,207
Printing & Stationeries	134,311	119,574
Internet expenses	5,500	12,500
Telephone charges	392,006	299,804
Books & periodicals	138,744	10,757
Training and Development	47,434	83,472
Auditors remuneration – for Audit	12,600	7,000
Auditors remuneration – for other services	11,550	3,000
Internal audit fees	20,900	
Refreshment & hospitality	83,288	46,286
Advertisement	81,757	51,629
Office expenses & maintenance	108,318	77,475
Legal and Professional charges	6,500	10,000
Sitting Fees and Honorarium	24,600	18,600
Insurance	10,469	-
Repairs and Maintenance	63,288	-
Other expenses	25,262	58,202
Total	**1,982,924**	**1,593,110**

Schedule 13: Notes forming part of Accounts

1. The Centre for Wind Energy Technology (C-WET) is an Autonomous Institution of Ministry of Non-Conventional Energy Sources, Government of India. The C-WET is formed as a Society on 18th February 1998 and registered as a society under Section 10 of the Tamil Nadu Societies Registration Act, 1975 on 21st March 1998 with the object to serve as the technical focal point for Wind Power Development in India, support Research and Development Programme, assess Wind Resources, establish Standards, Testing and Certification of wind power systems, sub-systems and components and undertake Human Resource Development Programmes.

2. All the income, movable and / or immovable properties of C-WET is solely utilised and applied towards the promotion of objectives as set forth in the Memorandum of Association and no profit thereof is paid or transferred directly or indirectly by way of dividend, bonus, profit, or in any manner whatsoever, to the present or past members of C-WET or to any of them or in any manner through anyone or more of the members. No members of C-WET has any personal claim on any movable and/ or immovable properties of C-WET or make any profit whatsoever, by virtue of his / her membership of C-WET.

3. Significant Accounting Policies:

   (a) The accounts are prepared in accordance with the accounting principles generally accepted in India.

   (b) The income and expenditure are provided in the accounts on accrual basis.

   (c) Fixed Assets are capitalised at acquisition cost inclusive of directly attributable cost. Depreciation on Fixed Assets is provided on Straight Line Method at the rates prescribed under Schedule XIV of the Companies Act, 1956. Depreciation on additions to Fixed Assets is provided at pro-rata basis. No depreciation is charged for the assets acquired on free of cost.

4. Grants-in-aid received during the year from Government of India for establishment of C-WET has been accounted under the head "Capital Fund".
5. Corpus Fund to carryout various research and development activities / policy studies; providing international assistance; or meeting incremental cost of providing better staff allowance and amenities has been created during the year with the approval of Governing Council (Sixth Meeting held on 26.03.2001) by transferring 50% of the fees for services and 100% of other incomes. Accordingly, a sum of Rs. 19,90,199/- has been transferred to Corpus Fund. However, a sum of Rs. 26 lakhs has been placed under Corpus Fund Deposit for three years considering the fees received in advance.
6. Government of Tamil Nadu granted permission to enter-upon land measuring about 4.41 acres at Survey No 657/1A2 at Pallikaranai Village, Tambaram Taluk, Kancheepuram District for construction of Campus and taken possession during March, 2001.
7. Amounts spent on partition works, venetian & vertical blinds, electrical fittings and other interior decoration works have been treated as Deferred Revenue Expenditure and proposed to be written off in four years. Accordingly a sum of Rs. 1,77,543/- has charged to revenue account.
8. Provision towards Gratuity and Pension has been provided as per respective rules / as per terms and conditions of deputation. Provision for Bonus has been provided based on the rules applicable for Autonomous Institutions.
9. A sum of Rs. 15,09,290/- (includes TDS of Rs. 23,163/-) has been received in advance for carrying out Provisional Type-Testing, Provisional Type Certification and Wind Resource Assessment Study and a sum of Rs. 9,397/- has been incurred for execution. As the projects are under execution stage, the balance amount along with tax deducted at source has been classified as Current Liabilities.
10. Prior period expenses of Rs. 1,80,689/- includes a sum of Rs. 1,76,866/- paid for the release of advertisement in dailies for inauguration of C-WET on 06.12.1999.

11. A request has been made to Government of India to retain sale value of Books and Data for Research and Development, Wind Resource Assessment, policy studies etc., and accordingly the same have been accounted under the head income.

12. Instruments & equipment and other assets worth Rs. 57,21,913/- is available to carryout Wind Resource Assessment studies at Wind Resource Assessment Project, Bangalore. The details are furnished below:

Sl. No.	Description	Value (Rs.)
1.	Computer, Instruments & Equipment	51,19,133
2.	Furniture & Fixtures	50,650
3.	Vehicles	16,000
4.	Instruments in Stores	5,36,130
	Total	**57,21,913**

The details of instruments in Stores, for which no depreciation is charged during the year as it is not put into use, are furnished below:

Sl. No.	Name of the item	Quantity	Value (Rs.)
1.	# 40 Maximum Anemometers	38	1,24,086
2.	NRG # 200 P Wind Vanes (10 k)	13	82,871
3.	NRG # 200 P Wind Vanes (1 k)	10	75,857
4.	NRG Tall Towers (%) M) without Anchors	01	2,53,316
	Total		**5,36,130**

13. A sum of Rs. 34,75,000/- has been released by Govt. of India to C-WET for carrying out various Wind Energy Resource Programme. The balance of Grants-in-aid of Rs. 2,27,062/- is shown under the head current liabilities. The details are furnished below:

(Rs.)

Sl. No.	Name of the Project	Balance as on 01.04.2000	Grants-in-Aid	Amt. Utilized	Balance as on 31.03.2001
1.	Wind Resource Assessment Project	201725	1625000	1648693	178032
2.	Micro Survey Project	300000	1850000	2100970	49030
3.	North-Eastern Project	100000	-	100000	-
	Total	**601725**	**3475000**	**3849663**	**227062**

14. Tamil Nadu Energy Development Agency granted permission to enter-upon land measuring about 8.64 acres at Ayyanaruthu and Panikerkulam Village, Kovilpatti Taluk, Thoothukudi District for establishment of Wind Turbine Test Station and taken during March, 2000. In-addition, land measuring about 4.81 acres has been purchased from private parties and registered in the name of C-WET, during March, 2000.

15. Assets worth Rs. 98,62,833/- is available in Wind Turbine Test Station at Kayathar, as detailed below:

Sl. No.	Details	Value (Rs.)
1.	Land	1,63,170
2.	Infrastructure Facilities	31,99,782
3.	Computer, Instruments & Equipment	71,220
4.	Furniture & Fixtures	23,157
5.	Vehicles	4,72,582
6.	Instruments supplied by DANIDA – Free of cost	59,32,922
	Total	**98,62,833**

16. A sum of Rs. 3,19,870/- has been spent towards maintenance of WTTS, as detailed below:

Sl. No.	Description	Value (Rs.)
1.	Inauguration Expenses	55,018
2.	Labour Charges	44,786
3.	Calibration and Consumables	39,440
4.	Clearing, Insurance and Transport	63,651
5.	Other expenses	116,975
	Total	**319,870**

17. Expenditure in Foreign Currency: NIL (previous year NIL)

18. Contingent liabilities not provided for: NIL (previous year NIL)

19. Estimated amount of contracts remaining to be executed on Capital Account and not provided for: NIL (previous year Rs. 8,03,918/-)

20. The figures shown in the accounts are rounded off to the nearest rupee. The previous year's figures have been re-grouped / reclassified wherever considered necessary to make them comparable with current year's figures.

21. The Department of Scientific and Industrial Research, Ministry of Science and Technology, Govt. of India, vide their letter no. 11/378/2000-TU-V dated 16.03.2000 recognized Centre for Wind Energy Technology as a Scientific and Industrial Research Organisation for a period from 08.03.2000 to 31.03.2003. The Director of Income Tax (Exemptions), Chennai, vide order no. DIT(E) No. 2 (268) / 98-99 dated 21.10.1999, granted registration under section 12AA of the Income Tax Act, 1961, as Public Charitable Trust.

22. Schedule 1 to 13 form an integral part of Balance Sheet and Income and Expenditure Account and have been duly authenticated.

Signature to Schedule 1 to 13

For Centre for Wind Energy Technology

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

A. Jayaraman
General Manager (F&A)

K.J. Sundararajamoorthy
Special Officer (Cdn.)

K. NARASIMHAM
Partner

Ajit K. Gupta
Executive Director

P.M. Nair
President / Chairman

Place: Chennai
Date: 13.08.2001

CENTRE FOR WIND ENERGY TECHNOLOGY

(An Autonomous Institution of Government of India)
CHENNAI – 600 101

Notice is hereby given that the Third Annual General Meeting of the Members of Centre for Wind Energy Technology will be held at the Conference Room, Ministry of Non-Conventional Energy Sources, Government of India, Block No. 14, CGO Complex, Lodhi Road, New Delhi - 110 003 on Monday, the 18th day of September, 2001 at 3.00 P.M., to transact the following business:

1. To receive, consider and adopt the Annual Report for the year 2000-2001, audited Balance Sheet as at 31st March, 2001, Receipt and Payments Account and Income and Expenditure Account for the year ended as on that date and Reports of the Auditors thereon.
2. To consider appointment of Auditors for the year 2001-2002
3. To consider amendment to Rule No. 28(b) of Rules and Regulations of Centre for Wind Energy Technology, and, if thought fit, to pass with or without modification, as a special resolution.

   RESOLVED THAT Rule No. 28(b) of Rules and Regulations of Centre for Wind Energy Technology be amended, as detailed below:

   "Rule No. 28(b): The Governing Council of the Society for the purpose of the Tamil Nadu Society's Registration Act of 1975, shall consist of the following:-

1.	Secretary, MNES	-	Chairman
2.	Executive Director, C-WET	-	Member-Secretary
3.	Head, Power Group, MNES	-	Member
4.	Financial Adviser, MNES	-	Member
5-7	Officials of the Central / State Governments and Undertakings, to be nominated by the Govt. of India.		
8-12	Experts / Persons of Eminence, to be nominated by the Govt. of India."		

For Centre for Wind Energy Technology

(Ajit K. Gupta)
Executive Director

Place : Chennai
Date : 23.08.2001