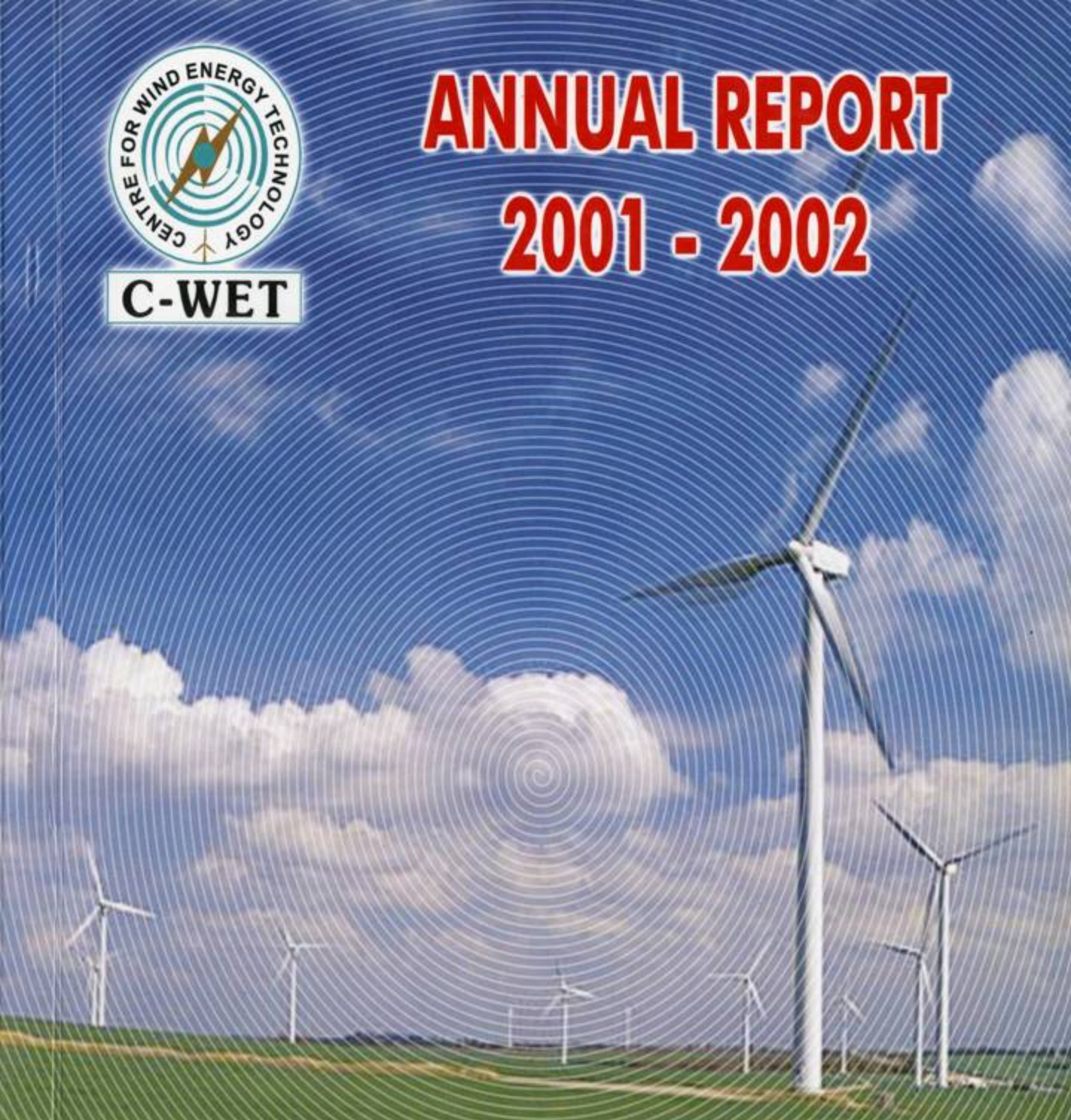
C-WET

ANNUAL REPORT 2001 - 2002



CENTRE FOR WIND ENERGY TECHNOLOGY

(An Autonomous Institution of Government of India)

CHENNAI

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CHENNAI – 600 101

C-WET

FOURTH ANNUAL REPORT

2001- 2002

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GENERAL INFORMATION

Chairman of the Governing Council and President of the Society:

Shri P.M. Nair,
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 and
Executive Director, Centre for Wind Energy Technology,
Chennai.

Governing Council Members:

Shri Arun Sharma, FA, Ministry of Non-Conventional Energy Sources, New Delhi.
Dr. V. Siddhartha, Outstanding Scientist, DRDO, New Delhi.
Shri R. Rathinasamy, Secretary, Energy, Government of Tamil Nadu, Chennai.
Dr. V. Bakthavatsalam, Managing Director, IREDA, New Delhi.
Shri K.M. Sahni, Director General, Bureau of Indian Standards, New Delhi.
Shri V.V. Ramakrishna Rao, Chairman, Central Electricity Authority, New Delhi.
Dr. T.S. Prahlad, Director, National Aerospace Laboratory, Bangalore.
Shri V.K. Neelakandhan, Director, ER&DCI, Thiruvananthapuram.
Shri Sarvesh Kumar, Chairman, IWTMA, Chennai.

Auditors:

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

Bankers:

Canara Bank,
Anna Nagar West Extension,
Chennai – 600 101.

Registered Office:

R-8, North Main Road,
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Chennai – 600 101.

ANNUAL REPORT 2001-2002

OVERVIEW

Wind Power Generation has attained maturity in India, on par with international development. The policies and programmes of the Ministry of Non-Conventional Energy Sources(MNES) regarding wind power development, supported by State Policies, including the evacuation of power by the State Electricity Boards, has placed India on the world wind energy map. To sustain wind energy development, and to help India achieve self-reliance in the power sector, supplementing the core conventional resources, MNES has undertaken development of the basic resources, infrastructure, and institutions for carrying out research and development, large scale demonstration and diffusion of the non-conventional energy technologies.

As a step towards achieving these broad goals, and to tackle the challenges in sustaining the development and accelerating the pace of utilization of wind energy in the country, the Centre for Wind Energy Technology (C-WET) has been established by MNES at Chennai, as an autonomous institution of Government of India. A Wind Turbine Test Station with technical and partial financial support from DANIDA, Government of Denmark, has been established at Kayathar in Thoothukudi district of Tamil Nadu as an integral part of the Centre.

Address by Shri M. Kannappan, Hon'ble Minister of State (Independent Charge) for Non-Conventional Energy Sources at a function organised by C-WET.

1.2 C-WET, a knowledge based institution of high quality and dedication, offers services and seeks to find total solutions for the major stake holders across the entire spectrum of the wind energy sector. It will support the wind turbine industry in achieving and sustaining quality, such that products of highest quality and reliability are installed, harnessing all energy available in the wind. The Centre will serve as a technical focal point of excellence to foster the development of wind energy sector in the country. The Centre functions through five units, namely, Wind Resources Assessment, Research & Development, Standards & Certification, Wind Turbine Testing and Information, Training and Commercial Services.

A warm welcome to Shri M. Kannappan, Hon'ble Minister of State (Independent Charge) for Non-Conventional Energy Sources on a visit to C-WET office in Chennai.

1.3 The Centre is at present housed in rented premises in Chennai. The Centre is fully furnished; equipment and instruments required for the office have been installed. The Government of Tamil Nadu has granted permission to 'enter-upon' a land measuring about 4.41 acres at Pallikaranai Village, Tambaram Taluk, Kancheepuram District (near Chennai) for construction of the campus for the Centre. Possession of the land was taken on 23rd March 2001. A Consultant Architect has been appointed. 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, site development and to oversee all aspects of implementation. The Construction Management has been entrusted with CPWD. The preliminary cost estimate for the construction of campus, including site development is Rs. 342.69 lakhs. A sum of Rs. 70 lakhs has been deposited with CPWD to start the initial construction activities. CPWD has issued orders for earth filling and soil investigation. A sum of Rs. 240 lakhs has been provided in the budget for the year 2002-2003 for construction of campus.

1.4 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 India nominates the Members of the Governing Council (Appendix-1). The tenure of the present Council is three years with effect from 18th February 2001. A Management Committee (comprising of Secretary, MNES; Financial Adviser, MNES; and Executive Director, C-WET) and a Finance Committee (comprising of Financial Adviser,

MNES; Secretary, Energy, Government of Tamil Nadu; Director, Wind Power, MNES; and General Manager (F&A), C-WET) have been constituted to assist the Governing Council.

1.5 The wind-monitoring programme / wind energy resource survey programme involves identification of high wind areas, 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. (above ground level) for periods of two to three years at these stations. As a result of wind energy resource survey programme, 219 potential sites having wind power density more than 150 W/m^2 at 20/25 m agl. have been identified. A comprehensive data on wind resource for 208 wind-monitoring stations has so far been published in six Volumes on "Wind Energy Resource Survey in India". The Sixth Volume of Handbook on Wind Energy Resource Survey in India was released by Shri M. Kannappan, Hon'ble Minister of State (Independent Charge) for Non-Conventional Energy Sources at Chennai on 13.08.2001.

Release of Sixth Volume of Handbook on Wind Energy Resource Survey in India by Shri M. Kannappan, Hon'ble Minister of State (Independent Charge) for Non-Conventional Energy Sources at Chennai on 13.08.2001.

Eighty-one potential sites, where wind power density is greater than 150 W/m^2 at 30 m agl in 10 States were taken up for Micro survey and preparation of Master Plans. Master Plans have been prepared for each of the 81 sites. The preparation of Micro-Survey report for 6 additional stations is under progress. A special programme was initiated to locate windy sites in North Eastern region, including Sikkim. Based on the findings of the special programme, 27 sites were selected for long-term anemometry. A consultancy project on micro level analysis of wind data for wind farm sites at Varapatti (existing wind farm) and Chandirapuram villages in Palladam Taluk of Coimbatore in one square kilometer area was also carried out.

1.6 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. 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 research and advanced technology development; technology support to wind power industry, improvement in the performance of existing wind turbine installations; manpower training and HRD; and research support to wind resource assessment are the five generic areas of the R&D activities of the Centre. 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.

1.7 A Type Approval Provisional Scheme – 2000 (TAPS–2000) has been prepared in line with International Certification Standards in association with the Technical Consultant of DANIDA. The scheme TAPS-2000, has been formulated under Category – I (for WTG systems already possessing valid type certificate or type approval); Category-II: (for WTG systems already possessing valid type certificate or type approval, with minor modifications/changes, supplemented by provisional type testing/ measurements at the test site of the Centre); and Category-III (for new or significantly modified WTG systems including provisional type testing and measurements at the test site of the Centre). Provisional Type Certification based on TAPS-2000 has been completed for WTG system V39-500 kW with 47 m rotor diameter of M/s Vestas RRB India Ltd, Chennai and WTG system N 3335 – 350 kW with 33.4 m rotor diameter of M/s Suzlon Energy Ltd., Ahmedabad, under Category–II. Shri M. Kannappan, Hon'ble Minister of State (Independent Charge) for Non-Conventional Energy Sources presented the First Provisional Type Certificate at Chennai on 13.08.2001 to the client-manufacturer.

Presentation of First Provisional Type Certificate by Shri M. Kannappan, Hon'ble Minister of State (Independent Charge) for Non-Conventional Energy Sources at Chennai 13.08.2001.

1.8 The Centre has been asked to draw up the list of manufacturers with models of WTGs of unit capacity 225kW and above that have obtained type approval, from designated independent testing and certification 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. Such list is being updated on quarterly basis, in consultation with MNES.

1.9 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) and other existing national standards. The Committee has recommended that the Centre can start the preparation of the standards in line with IEC. 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.

1.10 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.

Test Engineer explaining the functions of a Data Acquisition System to be coupled to Wind Turbine under test to Shri M. Kannappan, Hon'ble Minister of State (Independent Charge) for Non-Conventional Energy Sources during his visit to C-WET.

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. Infrastructure facility has been created for conducting type testing of two WTG systems with a total capacity of 1.4 MW. The provisional type testing of WTG system 1000 kW with 60 m Rotor diameter of Suzlon Energy Limited and 225 kW with 29.6 m Rotor diameter of NEPC India Limited have been carried out during windy season 2001.

1.11 A Five-Year Plan 2002-2007 has been prepared based on Tenth Five Year Plan of the Ministry of Non-Conventional Energy Sources. During the Plan period, a campus for the Centre at Chennai and an Office-cum-Workshop Building for WTTS, Kayathar will be constructed. Infrastructure facilities will be created to test Wind Turbine Generating System upto 3 MW at WTTS. An R&D Lab will be established. The wind monitoring programmes; research and development projects; type testing and field-testing of WTGs; and certification of WTGs will be carried out. The total outlay for the plan period will be Rs.20 crores, of which Rs.15 crores will be obtained in the form of Grants-in-aid from the Government and Rs. 5 crores will be realized as revenue by the Centre. The funds required for salary component of the entire Centre will be met from the revenue generated on execution of consultancy projects.

1.12 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. During the year, a sum of Rs.150.00 lakhs has been received as Grants-in-aid for establishment of the Centre and carrying out various projects / studies.

1.13 The Ministry has created 40 posts under different categories as against a total strength of 76 employees as indicated in the Detailed Project Report. Appointments for 28 posts under different categories have been made. The process of selection and appointment for the balance posts is under process. The manpower required for supporting services is engaged on hiring basis. Human resource development received special attention and employees at various levels were nominated to attend professional training courses, workshops and seminars. The morale of the employees continued to remain high, facilitating smooth working of the organization and contributing to its achievements. The employees of the Centre participated and made presentations at seminars and symposiums organized by various institutions to disseminate information on the activities of the Centre.

1.14 Five projects with a consultancy fee of Rs. 189.31 lakhs have been completed and seven projects with a consultancy fee of Rs. 40.73 lakhs are under execution. A sum of Rs. 189.31 lakhs has been spent. The accounts of the Centre have been audited as per the provisions of the Tamil Nadu Societies Registration Act, 1975. The Annual Accounts consisting of Balance Sheet as on 31st March 2002, Income and Expenditure Account, Receipts and Payments Account along with Schedules and Reports of the Auditors are enclosed (Appendix-2). An internal audit system has been introduced with effect from financial 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. For better utilization of men and materials, a cost accounting system is formulated by introduction of time card for each employee, project manpower card for each project, project history card, project completion report and internal unit-wise utilization certificate.

1.15 As a part of Study Tour, the Parliamentary Standing Committee on Energy discussed with the officials of the Centre regarding exploitation of various sources of non-conventional energy on 02.02.2002.

Chairman and Members of Parliamentary Standing Committee on Energy on a visit to Chennai on 02.02.2002

1.16 The Centre wishes to place on record the valuable services rendered by Shri Lal Rawna Sailo, Shri S. Nautiyal, Shri D.V. Khera and Shri C.S. Rao as Members of the Governing Council. 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. The Centre also appreciates the valuable and dedicated services rendered by the employees at all levels during the year.

2. WIND RESOURCE ASSESSMENT

Rapid commercial utilization of wind as a source of energy is the principal goal of all wind energy sector. Assessment of the wind resource plays an important role in achieving this goal, because utility planning, design of wind turbines, and marketing depend on detailed information on wind resource. Correct estimation of the energy available in the wind is the backbone of the economics of wind farm development. For this reason the most important factor to consider in the construction of a wind energy facility is the knowledge about site wind resource. Wind resource assessment technologies have improved greatly in recent years. In India the wind resource assessment programme involves (a) Identification of Stations with strong winds (b) Establishment of wind monitoring stations and (c) Collection and processing of time series data on wind speed and direction at 10 m and 20 / 25 m level for the periods of two to three years at these stations. 64 wind monitoring stations (Table-1) are in operation in ten States and one Union Territory.

2.2 The wind resource assessment programme is being implemented in coordination with the State Nodal Agencies. Under this programme 449 wind monitoring stations have been established till date in 17 States and 3 Union Territories, since inception of this programme in 1986. Stations possessing wind power density of more than 150 w/sq.m at the extrapolated height of 30m are considered to be good for economic wind farming activities. 219 wind monitoring stations (Appendix-3), covering sites in 13 States / Union Territories viz. Tamil Nadu, Gujarat, Orissa, Maharashtra, Andhra Pradesh, Rajasthan, Lakshdweep, Karnataka, Madhya Pradesh, Kerala, West Bengal, Andaman & Nicobar and Uttaranchal became suitable for wind farming under this criterion.

Meteorologist working on the data logging system at the reference Wind Monitoring Station at Kayathar.

2.3 To study the vertical variation of wind speeds at selected climatic regimes, a programme of measurement using 50 m high mast initiated and one mast was installed and operated for one year at Vajrakarur in Andhra Pradesh. Two more 50 m masts were subsequently commissioned, one each at Nelganti in Karnataka and Vankusavade in Maharashtra. Such measurements will also be taken up at a few other locations covering different climatic regions. Quantitative estimates of the power law index, which is a very important parameter in wind resource assessment, has been obtained for Vajrakarur, Nelganti and Vankusavade after a study of the specially collected data (Table-2).

Table - 1

WIND MONITORING STATIONS IN OPERATION AS ON 31.03.2002

Sl. No.	State	As on 31.03.2001	No. of stations		
			Commissioned during 2001-2002	Closed down during 2001-2002	in Operation as on 31.03.2002
1	GUJARAT	12	4	5	11
2	MAHARASHTRA	17	6	13	10
3	ANDHRA PRADESH	11	1	5	7
4	RAJASTHAN	5	2	-	7
5	KARNATAKA	11	-	4	7
6	TAMIL NADU	10	-	5	5
7	MADHYA PRADESH	5	3	3	5
8	HIMACHAL PRADESH	4	1	-	5
9	JAMMU & KASHMIR	3	-	-	3
10	WEST BENGAL	2	-	-	2
11	LAKSHADWEEP	1	1	-	2
12	KERALA	1	-	1	-
	TOTAL	**82**	**18**	**36**	**64**

Table - 2

MONTH WISE POWER LAW INDEX

Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Vajrakarur	0.21	0.15	0.18	0.13	0.10	0.10	0.09	0.11	0.13	0.15	0.22	0.22
Nelganti	-	0.26	0.21	0.18	0.17	0.18	0.19	0.20	0.20	0.28	0.32	0.32
Vankusavade	-	-	-	-	-	0.15	0.16	0.16	0.16	0.21	0.23	0.21

1. The values are based on the wind speed at 10m - 50m slab.
2. Vajrakarur data based on April 1999 – March 2000
3. Nelganti data based on February 2001 – December 2001
4. Vankusavade data based on June 2001 – December 2001

2.4 A Data bank on wind meteorology of India is being put together and maintained. Appropriate meteorological data are being collected from various sources for the data bank.

2.5 To assess the "Zone of influence" and potential available around selected wind monitoring stations for commercial exploitation, the project on micro-survey was initiated. The measured wind data is normally valid only at the location of measurement, and to predict wind resource over an extended area of several tens of Sq. Km around the observation point a suitable model is used. 12 potential sites, where wind power density is greater than 150 W/m^2 at 30 m agl, in Tamil Nadu, Maharashtra, Karnataka and Andhra Pradesh were taken up. Study on six sites viz. Mannikere, Mavhinnahunda, Vajrakarur, Mettukadai, Tirumalayapalle and Dongarwadi completed. Wind analysis, Estimation of wind energy potential and a Master Plan for the identified areas prepared for each of the six stations. With this the total stations covered under micro survey study is 81 (Table-3).

The estimated wind energy potential from the 81 micro survey sites works out to 16712.2 MW at 50m above ground level. The site wise estimated potential for each of the ten states is given in Table-4. Copies of these reports on any of the stations available for sale.

Table-3

Sl. No.	State	No. of reports on zone of influence
1	Tamil Nadu	17
2	Gujarat	15
3	Maharashtra	14
4	Karnataka	14
5	Andhra Pradesh	11
6	Rajasthan	3
7	Madhya Pradesh	3
8	Orissa	2
9	Kerala	1
10	West Bengal	1
	Total	**81**

The 25m reference Wind Monitoring Station at Kayathar

Table – 4

ESTIMATED WIND ENERGY POTENTIAL FROM MICRO SURVEY STUDY

Sl. No	Name of the States	No. of Statn.	No. of Sites	MW 30 m level	MW 40 m level	MW 50 m level	MW 100 m level
1	Tamil Nadu	17	90	4314.7	4317	4318.4	309.2
2	Gujarat	15	155	5525.5	6944.6	7385.8	
3	Maharashtra	14	160	663.3	871.4	1391.6	380.7
4	Karnataka	14	80	724.1	955.5	1207.6	482.3
5	Andhra Pradesh	11	98	961.3	1109.4	1420.3	1093.6
6	Madhya Pradesh	3	40	56	97.5	148	
7	Rajasthan	3	19	206	290.8	334	
8	Orissa	2	19	77	89	99	
9	Kerala	1	4	285.3	285.2	285	
10	West Bengal	1	11	22	55	114	
		81	**676**	**12835.2**	**15015.4**	**16712.2**	**2265.8**

2.6 The North-Eastern India is endowed with low levels of wind resource potential compared to the other regions of the country as per general climatological considerations. It was therefore felt that the conventional approach of selecting sites in this region. might not yield good results. Realizing this, a "Special Programme" was initiated to locate windy sites in this region including Sikkim.

Twenty-seven sites were selected for long-term anemometry at 25m level in North Eastern region. This is being taken up in coordination with the State Nodal Agency as a MNES sponsored programme. Sites selected are given in Table-5.

Based on the findings of the consultants from short-term anemometry and study of surface and upper wind data of the region and overall merits, 27 sites have been selected for long-term anemometry in the North-Eastern States (Table-5).

Table – 5

Sl. No.	STATE	Sl. No.	Name of the Site
1	Arunachal Pradesh	1	Sela Pass
		2	Raga
		3	Rupa
		4	Likabali
		5	Shimong-Yinkiong

2	Assam	1	P. Leikul
		2	Kalimkhu/Muldum
		3	Tolpoi
3	Manipur	1	Laimaton
		2	Tamenlong/Kollen
		3	Maring Phumon
		4	Tengnoupal
		5	Phungyar/Phangrai
4	Meghalaya	1	Nongbah/Mynso
		2	Maryngksihi
		3	Mauphlang
5	Mizoram	1	Sekawrhmuai Tlang
		2	Reiek
		3	Hmuifang Tlang
		4	Theriat Tlang
		5	Thingfal
6	Sikkim	1	Bunker point/ Kerang
		2	Thangu
		3	Sherthang
7	Tripura	1	Betling Sib
		2	Vaisam/Thangsang
		3	Niungmamura/ Bichangpara

2.7 A consultancy project on micro level (100m x 100m) analysis of wind data for wind farm sites in one Sq. Kilometer area at Varapatti and Chandirapuram villages in Palladam Taluk, Coimbatore has been completed.

2.8 A consultancy project for commissioning of five wind monitoring stations and collection & analysis of data for Maharashtra Energy Development Agency (MEDA) under IREP is under progress. The five wind monitoring stations has been established during November-December 2001 at Kharumbapada, Kogda, Kankora, Rajewadi and Aundhewadi in Thane, Aurungabad, Pune and Nashik districts. This will further strengthen the Wind Monitoring database already available for the Maharashtra state as well as help in identification of windy sites in the unrepresentative regions.

2.9 Preparation of Detailed Project report for Demonstration Wind Farm projects for 2MW capacity each at Mahoriya and Mamathkeda for Madhya Pradesh Urja Vikas Nigam Ltd. Bhopal is under way.

2.10 Preparation of Detailed Project Report for 2 x 50 kW Wind Diesel project at Keating Point at Car Nicobar in Andaman & Nicobar Islands is also under progress.

2.11 A study on wind characteristics of four Off-Shore sites based on the data collected from shallow data buoys deployed by National Institute of Ocean Technology, Chennai in Arabian Sea and Bay of Bengal carried out.

3. RESEARCH & DEVELOPMENT

3.1 C-WET 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 industry towards production of cost effective, high quality wind power systems.

Research & Development (R&D) in wind energy sector aims to

- Develop new designs and technology appropriate to wind regimes and conditions in India;
- Maximize energy conversion from wind;
- Improve the quality of the components and the system as a whole;
- Maximize the reliability and availability;
- Minimize the weights and cost of the system in order to minimize overall capital cost as well as generation cost per kilowatt-hour; and
- Keep pace with state-of-art technology.

3.2 A Research & Development Council (RC) has been constituted, comprising of eminent scientists and engineers, to guide the Centre in Research, Development, Test and Evaluation programmes / projects. The composition of the Research & Development Council is given in Appendix-4. The RC met twice during the year on 30th October 2001 at New Delhi and 8th March 2002 at New Delhi.

3.3 The Research & Development Council upon deliberations has classified the research activities of the Centre into the following five generic areas:

- Improvement in Performance of existing Wind Turbine Installations.
- Research Support for Wind Resource Assessment
- Manpower Training and HRD
- Technology Support to Wind Power Industry
- Research and Advanced Technology Development

3.4 The following projects are under execution for making improvement in the performance of existing grid-connected WTGS.

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; 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. Analysis of data collected and preparation of report was under progress.

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 guides in fixing of the pitch angle of the blades for a stall regulated WTGS according to prevailing site conditions. Increasing the pitch angle can increase the power and hence the annual energy production. However, correspondingly the loads on the WTGS 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 was completed. The experimentation will be carried out in the wind season of 2002.

3.4.3 Failure Analysis of Gear Boxes of Wind Turbines: Gearbox is the most critical and costly component of WTGS. Any failure in the gearbox is a costly and time-consuming process. The reasons for failures may be due to 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 costs of repairs and replacement of gearboxes and increase the availability of the system for generation. The project started in November 2001. Interim report submitted by the Consultant is under review.

4. STANDARDS & CERTIFICATION

4.1 The Certification unit of C-WET has been undertaking activities for issue of Provisional Type Certificates (PTC) of Wind Turbines (WTs) according to the "Type Approval - Provisional Scheme – 2000 (TAPS-2000)". The unit has undertaken formulation of Type Certification/Approval Scheme (TAS) by improving TAPS - 2000 based on the experiences gained. Preparation of Indian Standards for wind energy sector in line with International Standards (IEC) is one of the prime activities of the unit.

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 WTs and is applicable only to the grid- connected, horizontal-axis WTs with rotor swept area greater than 40 m^2.

4.3 The other activities include inspection of the WTs 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 WTs to enable updating of TAPS-2000 and improvement of the TAPS-2000 by incorporating necessary changes based on the experience gained.

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

- Category- I: PTC for WTs already possessing valid type certificate or type approval.
- Category-II: PTC for WTs 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 WT (WT type) based on the verification of the documentation provided by the manufacturer/ supplier as per the TAPS –2000.

4.5 The review / verification of documentation for the Provisional Type certification of Vestas V39-500 kW with 47 m rotor wind turbine of M/s Vestas RRB (India) Ltd. carried out along with T.C, RISO has been completed. The first Provisional Type Certificate from C-WET has been issued to M/s Vestas RRB (India) Ltd.

on 13.8.2001 by Shri M. Kannapan, Honorable Minister of State for Non-conventional Energy Sources, at a meeting organized by C-WET at Chennai.

4.6 The Provisional Type Certification process of the N 3335/ 350 kW WTGS has been completed and the Provisional Type certificate has been approved by Chairman, GC.

4.7 Provisional Type Certification of WT NEPC-225 kW of M/s NEPC India Limited, Chennai was taken up under Category-III according to TAPS-2000. The PTC is being carried out; the safety and function tests, and other measurements for Provisional Type Testing of the WT were carried out at the Wind Turbine Test Station (WTTS), Kayathar, as a part of the requirements of TAPS-2000.

4.8 Provisional Type Certification of WT S60 – 1000 kW of M/s Suzlon Energy Ltd., Pune, was taken up under Category–III, according to TAPS-2000. The PTC is being carried out; the safety and function tests and other measurements for Provisional Type Testing of the WT were carried out at the Wind Turbine Test Station (WTTS), Kayathar, as a part of the requirements of TAPS-2000.

Witnessing of Safety and Function Test at WTTS, Kayathar

4.9 The Provisional type certification of Enercon E-30 – 230 kW Wind Turbine Generator System was completed under Category I according to TAPS-2000. The type certificate has been issued upon the approval of the Chairman, GC.

4.10 The 1.25 MW WT of Suzlon Energy Limited and 250 kW WT of TTG Industries Ltd have been selected, upon the approval of Chairman GC for Provisional Type Certification under Category III to be taken up in the year 2002-2003.

Signing of agreement, for certification with customer

4.11 Centre has been issuing the list of 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.

4.12 Establishing the ISO 9000-2000 system, in association with RISO, T.C, and DNV, Chennai has been initiated. DNV, Chennai has been

appointed as consultant for carrying out the establishment of the quality system.

5. WIND TURBINE TESTING

5.1 During the year 2001-2002, the Wind Turbine Test Station (WTTS) made good progress in the field. Two tests were completed at Kayathar and one in-situ power curve measurement programme has been initiated. Construction of test station building at Kayathar has made good progress. A number of training programme were organized both at RISO, Denmark and at Kayathar. Apart from this, refresher courses were offered by IIT, Chennai on specific topics for the Test Engineers.

5.2 The WTTS is located in the southern part of Tamilnadu at Ayyanaruthu Village, near Kayathar, Kovilpatti Taluk in Thoothukudi District, 575 kms from Chennai on the way to Kanyakumari. The test station is inside the demonstration wind farm set up jointly by Ministry of Non-Conventional Energy Sources with Tamil Nadu Energy Development Agency and Tamil Nadu Electricity Board with the support of DANIDA during the year 1989. Two test beds have been established on the western side of the wind farm and the locations were decided in consultation with the experts of RISO National Laboratory, Denmark. The terrain of the land is flat with a gentle slope and is ideal for testing of WTGS since the terrain variations comply with the requirements of International Electro technical Commission (IEC).

5.3 The wind flow in Kayathar area is predominantly from the western direction through Shencottah Pass in the Western Mountain ranges. The Pass is about 50 kms west of the Wind Turbine Test Station.

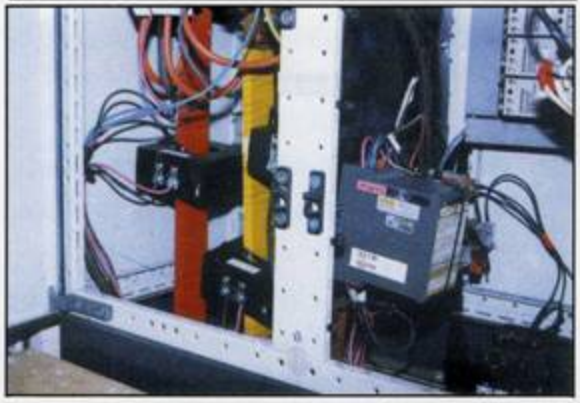
5.4 In order to carry out testing upto 1000 kW capacity, the facilities at the test bed A was increased from 600 kW to 1000 kW and the heights of both met masts were modified and restructured to suit the hub heights of the respective turbines during the year 2001-2002.

5.5 The construction management of office-cum-workshop building was entrusted with CPWD. The preliminary cost estimate for the construction is Rs. 21.50 lakhs. A sum of Rs. 7.20 lakhs was deposited with CPWD to start the construction activities. The contract for civil works has been awarded and the work upto foundation has been completed. The entire building work will be completed by August, 2002.

5.6. The WTTS has been equipped with the following facilities for carrying out provisional type testing of wind turbines:

- Two met masts one for each test bed, having adjustable sections and telescopic arrangement at the top section, so as to modify the mast height to suit the hub height of the test turbine.
- Readily available grid connection for each test bed.
- Test bed A has facilities to test wind turbine up to 1000 kW capacity and Test bed B has the facilities to test wind turbines upto 400 kW capacity.
- Two control rooms close to each test bed, each measuring 4m x 3m in size, to house the control panels and the data acquisition systems.
- PC based data logging system.

Instrumentation on Met Mast



Instrumentation on Wind Turbine Control Panel

1000 kW Wind Turbine under Test at Test Bed - A

5.7 The Provisional Type Testing on two Wind Turbine Generator Systems has been carried out during the wind season of 2001 (one 1000 kW turbine with 60 metre rotor diameter and 60 metre hub height at the test bed A and one 225 kW wind turbine with 29.6 metre rotor diameter and 45 metre hub height at the test bed B). The testing has been commenced during July, 2001 and completed during October, 2001. After analysis of data, the draft test reports were presented to the clients during March, 2002. A sum of Rs. 26.45 lakhs was earned as fees.

TESTS CARRIED OUT

YEAR	NO. OF TESTS	CAPACITY OF THE TURBINE
1999	Two (Power Performance Tests at Site)	500 kW, 39m Rotor diameter of Vestas make and 250 kW, 29.7m Rotor diameter of BHEL make
2000	Two (Type Test at WTTS)	500 kW, 47m Rotor diameter of Vestas make and 350 kW, 33.4m rotor diameter of Suzlon make
2001	Two (Type Test at WTTS)	1000 kW, 60 m Rotor diameter of Suzlon make and 225 kW, 29.6m Rotor diameter of NEPC make

225kW Wind Turbine under Test at Test Bed-B

5.8 The selection of two Wind Turbine Generator Systems for provisional type testing during the wind season of 2002 was completed. Action has been initiated to increase the capacity of the test bed-A to 1250 kW and alterations in the height of the met masts.

5.9 An agrement has been signed during March, 2002 to take up power performance measurement of one 750 kW wind turbine at Dalmia Windfarm in Kanyakumari District of Tamilnadu for M/s NEG Micon India Limited.

6. INFORMATION, TRAINING AND COMMERCIAL SERVICES

6.1 Based on the Tenth Plan of the Ministry, a Five Year Plan for C-WET has been prepared. In order to get the input for the Plan, a Stakeholders' Meeting comprising of manufacturers, developers and research institutions was organised on 24th January, 2002. Based on the input received a Draft Plan was prepared. A Working Group comprising of Shri. J.P.L.N. Sastry, Dr. R. P. Gupta, Shri M.P. Ramesh and Shri N.S. Prasad, met on 29th January, 2002 reviewed the Plan. After incorporating the suggestions of the Working Group, the Five Year Plan was placed before the R&D Council and Finance Committee during March, 2002. Based on the recommendations of R&D Council and Finance Committee, the Governing council in its Ninth Meeting held during March, 2002, approved the Five Year Plan 2002-2007 for implementation.

6.2 A Srilankan delegation visited the Centre on 29th March 2002 and a presentation was made about the activities of the Centre and the possibility of providing various services for development of the wind power sector in Srilanka. A presentation on TAPS-2000 has been made to the delegation from Ceylon Electricity Board on 28th March, 2002.

6.3 The officials of the Centre attended the following Seminar, Workshop and Conference:

6.3.1 Shri K.C. Dhimole, Shri E. Sreevalsan and Shri R. Sasikumar of WRA Unit of the Centre participated in the Advanced School on Recent Advances in Climate and Environmental Research (RACER) at CSIR Centre for Mathematical modeling and Computer simulation, Bangalore from 11-13 April 2001.

6.3.2 Shri E. Sreevalsan and Shri K.C. Dhimole was attended Kerala Science Congress Proceedings January 2002 and a paper on "Assessing the accuracy of WAsP model in Palghat gap and Adjacent Hills" was presented.

6.3.3 Shri. K.C. Dhimole participated in National workshop on GIS Technologies and sustainable Development at Local Level from 9-11 October, 2001 in New Delhi organized by Ministry of Science and Technology and IIT Delhi / Mumbai.

6.3.4 Shri. K.C. Dhimole and Shri. E. Sreevalsan participated in a National Wrokshop on Renewable Energy and Energy Conservation organized by Kumaraguru College of Technology, Coimbatore on 17th December 2001. A paper on "Role of Wind Energy in Energy Conservation" presented during the workshop.

6.3.5 Shri. K.C. Dhimole delivered the Ratindar Nath Memorial Lecture on Wind Power Development on 29th December 2001 at The Institution of Engineers (India), Local Centre, Jabalpur.

6.3.6 Shri. K.C. Dhimole, Shri. E. Sreevalsan, and Shri. R. Sasi Kumar presented a paper on "Wind Resource Assessment over India" in an International Seminar on Decentralized Energy Systems: Options and Management organized by the Institution of Engineers (India), Kolkatta on 23rd February 2002.

6.3.7 Ms. Deepa Kurup, Junior Engineer (R&D), was attended the two-day conference on "Harmonics–2001' organized by Confederation of Indian Industry (CII) on 24.11.2001 and 25.11.2001.

6.4 The officials of the Centre attended the following Training programmes:

6.4.1 Ms. Deepa Kurup and Shri. S. Suresh Babu was attended one-day seminar on Device Programmer conducted by BP Microsystems, USA on 23.04.2001.

6.4.2 Shri. N.S. Prasad, Shri. A. Senthil Kumar and Shri. E. Sreevalsan were attended one week course on "Computation of Internal Flows" organized by the Department of Mechanical Engineering, IIT, Chennai from 11.06.2001 to 16.06.2001.

6.4.3 Shri. N.S. Prasad, Shri. A. Senthil Kumar and Shri. E. Sreevalsan were attended a one-day programme on "CFD for Process Industry Applications" under Technology Appreciation Programme conducted by Centre for Industrial Consultancy & Sponsored Research, IIT, Chennai on 06.07.2001.

6.4.4 Ms. Deepa Kurup and Shri. S. Suresh Babu were attended six weeks Mechanical engineering course conducted at IIT, Madras during September-October, 2001.

6.4.5 All the Engineers / Scientists in Testing, R&D and S&C Units attended a tailor-made short-term refresher course, in Materials, Structural Mechanics and Vibrations & Dynamics organised by IIT Madras during September-October, 2001.

6.4.6 The core staff of eight Engineers and Scientists of Testing and Certification Units attended a six weeks Expert Training programme by RISO National Laboratory at Denmark for the period from 3rd November, 2001 to 15th December, 2001 on Wind Turbine

Design Overview; Data Analysis Overview; Wind Characteristics; Wind Turbine Aerodynamics; Loads and safety Requirements; Wind Turbine Structural Mechanics / Dynamics; Finite Element Method; DataBase for DataBase Management; Introduction to Turbo Pascal; Wind Turbine Aeroelastic; Introduction to Flex 5; Data Acquisition Fundamentals; Introduction to Riso Data Acquisition Unit; Introduction to Dadisp; Strain Gauge Techniques; Strain Gauge Practice; Power Quality Assessment; Practical working on Flex Samples and Daq Samples; Quality Management; and Project Management.

6.4.7 Shri. K.J. Sundararajamoorthy, Unit Chief, Testing and Shri Dilip Nigam, Principal Scientific Officer of MNES attended the two weeks training and planning programme organized by RISO National Laboratory at Denmark during December, 2002.

6.4.8 On the job training on strain gauging and supervision of instrumentations, preparatory work for testing, load calibration and tip photography during the year for the Engineers of Testing Unit by the RISO National Laboratory at Wind Turbine Test Station at Kayathar.

6.4.9 The Training of Trainers programmes have been organised during the year during 2001-2002.

6.5 A Business Meet on Wind Energy jointly organized by C-WET and TEDA on 30th July 2001 at Chennai. The C-WET officials made a presentation in this Business Meet on various activities of the Centre.

6.6 One M.Tech., student from School of Energy and Environmental studies, Devi Ahiliya Vishwavidhalaya, Indore carried out a Project on "WASP Modeling of Jamgodrani Area" under the guidance of the Dr. E. Sreevalsan, Senior Scientist, WRA and two B.Tech., students of Department of Mechanical Engineering, IIT, Chennai, underwent summer training for a period of six weeks on "planning of experimentation for Optimal Blade Angle for Energy Maximisation" and "Study of the gearboxes of wind turbines".

APPENDIX - 1
Vide Para 1.4

MEMBERS OF GOVERNING COUNCIL AS ON 31.03.2002		
1	Shri P.M. Nair, Secretary, Ministry of Non-Conventional Energy Sources, New Delhi – 110 003.	Chairman and President of the Society
2	Shri Arun Sharma, Financial Adviser, Ministry of Non-Conventional Energy Sources, New Delhi – 110 003.	Member
3	Shri Ajit K. Gupta, Adviser & Head Power Group, Ministry of Non-Conventional Energy Sources, New Delhi – 110 003.	Member
4	Shri R. Rathinasamy, Secretary, Energy, Govt. of Tamil Nadu, Secretariat, Fort St. George, Chennai – 600 009.	Member
5	Shri K.M. Sahni, Director General, Bureau of Indian Standards, New Delhi –110 002.	Member
6	Shri V.V. Ramakrishna Rao, Chairman, Central Electricity Authority, New Delhi – 110 006.	Member
7	Dr. V. Bakthavatsalam, Managing Director, Indian Renewable Energy Development Agency (IREDA), New Delhi - 110 003	Member
8	Dr. T.S. Prahlad, Director, National Aerospace Laboratory, Bangalore – 560 017.	Member
9	Dr. V. Siddhartha, Outstanding Scientist, DRDO Ministry of Defence, New Delhi – 110 011.	Member
10	Shri V.K. Neelakandhan, Director, Electronics Research and Development Centre of India (ER&DCI), Thiruvananthapuram – 695 033.	Member
11	Shri Sarvesh Kumar, Chairman, Indian Wind Turbine Manufacturers Association, Chennai – 600 008.	Member
12	Shri Ajit K. Gupta, Executive Director, Centre for Wind Energy Technology, Chennai – 600 101.	Member-Secretary

APPENDIX - 2
Vide Para 1.14.

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

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

Managers:
K. RAMAKRISHNA
K. RAVISHANKAR

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

Phone 852 5067
Res 434 2523
434 1957

Residence:
20.21, Madley Road,
T.Nagar,
Madras – 600 017.

AUDITORS REPORT

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 2002, Receipts and Payments Account and Income and Expenditure Account for the year ended as on that date along with Schedules, Significant Accounting Policies and Notes forming part of accounts annexed there to. These financial statements are the responsibility of the Centre for Wind Energy Technology (An Autonomous Institution of Government of India). Our responsibility is to express an opinion on these financial statements based on our audit.

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

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 those books.

3. The Balance Sheet, Receipts and Payments Account and Income and Expenditure Account dealt with by this report are in agreement with the books of account. The accounts are prepared based on the Uniform Format of Accounts for Central Autonomous Bodies.

4. In our opinion and to the best of our information and according to the explanations given to us, the said accounts read together with the schedules, accounting policies and notes thereon give a true and fair view in conformity with the accounting principles generally accepted in India:

   (i) In the case of the Balance Sheet, of the state of affairs of the Centre for Wind Energy Technology as at 31st March 2002.

   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.Gnanandandulu & Co.,**
Chartered Accountants

Place : Chennai.
Date : 03.09.2002

(K. NARASIMHAM)
Partner.

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

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

Managers:
K. RAMAKRISHNA
K. RAVISHANKAR

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

Phone 852 5067
Res 434 2523
434 1957

Residence:
20.21, Madley Road,
T.Nagar,
Madras – 600 017.

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 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 : 03.09.2002

(K. NARASIMHAM)
Partner.

BALANCE SHEET AS AT 31ST MARCH 2002

(Amount in Rs.)

CAPITAL FUND AND LIABILITIES	Schedule	Current Year	Previous Year
CORPUS AND CAPITAL FUND	1	20,224,726	23,023,751
RESERVES AND SURPLUS	2	8,843,872	1,990,199
EARMARKED AND ENDOWMENT FUNDS	-	-	-
SECURED LOANS AND BORROWINGS	-	-	-
UNSECURED LOANS AND BORROWINGS	-	-	-
DEFERRED CREDIT LIABILITIES	-	-	-
CURRENT LIABILITIES AND PROVISIONS	3	3,277,377	2,493,592
TOTAL		**32,345,975**	**27,507,542**
ASSETS			
FIXED ASSETS	4	20,564,873	18,079,008
INVESTMENT - FROM EARMARKED AND ENDOWMENT FUNDS	-	-	-
INVESTMENT - OTHERS	-	-	-
CURRENT ASSETS, LOANS AND ADVANCES	5	11,781,102	8,957,628
MISCELLANEOUS EXPENDITURE (to the extent not written off or adjusted)	-	-	470,906
TOTAL	-	**32,345,975**	**27,507,542**
SIGNIFICANT ACCOUNTING POLICIES	13		
NOTES ON ACCOUNTS	14		

For Centre for Wind Energy Technology

As per our Report attached
For K. Gnanandandulu & Co.,
Chartered Accountant

A. JAYARAMAN	M.P. RAMESH	S.S. DAWRA	K. NARASIMHAM
General Manager(F&A)	Executive Director	President / Chairman	Partner

Place : Chennai
Date : 03.09.2002

INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED 31ST MARCH 2002

(Amount in Rs.)

INCOME	Schedule	Current Year	Previous Year
Income from Sales and Services	6	4,438,210	1,750,000
Income from publication	7	394,400	272,500
Interest Earned	8	708,254	309,247
Other Income	9	40,978	4,311
TOTAL (A)		**5,581,842**	**2,336,058**
EXPENDITURE			
Establishment Expenses	10	4,661,091	3,460,337
Other Administrative Expenses	11	5,121,965	3,864,648
Depreciation	4	3,739,009	1,088,732
TOTAL (B)		**13,522,065**	**8,413,717**
Balance being excess of Expenditure			
Over Income (A-B)		7,940,223	6,077,659
Prior period adjustment	12	38,376	180,689
Transfer to General Reserve		920,751	-
Transfer to Corpus Fund		-	1,990,199
BALANCE BEING DEFICIT CARRIED TO CAPITAL FUND		**8,899,350**	**8,248,547**
SIGNIFICANT ACCOUNTING POLICIES	13		
NOTES ON ACCOUNTS	14		

For Centre for Wind Energy Technology

As per our Report attached
For K. Gnananandulu & Co.,
Chartered Accountant

A. JAYARAMAN	M.P. RAMESH	S.S. DAWRA	K. NARASIMHAM
General Manager(F&A)	Executive Director	President / Chairman	Partner

Place : Chennai
Date : 03.09.2002

RECEIPTS AND PAYMENTS ACCOUNT

RECEIPTS	Current Year	Previous Year
I. Opening Balances		
(a) Cash in hand		
(b) Bank balances		
i) In Current Account	5,743,304	4,192,839
ii) In Deposit Accounts	2,600,000	-
(c) Stamps on hand	1,170	15
II. Grants Received		
(a) From Government of India	15,000,000	12,460,000
(b) From Government of India for execution of Wind Resource Assessment Project	225,000	3,475,000
III. Income on Investments		
IV. Interest Received		
(a) On Bank deposits	708,254	309,247
V. Other Income		
(a) Fees for services	3,125,000	1,750,000
(b) Income from publications	394,400	272,500
(c) Energy receipts	1,094,342	-
(d) Misc. income	40,978	4,311
VI. Amount borrowed		
VII. Any other receipts		
(a) Fees received in advance (Consultancy)	589,087	832,415
(b) Other advance	8,477	101,725
(c) Dues received from MNES	126,651	-
(d) Service Tax	141,750	-
TOTAL	**29,798,413**	**23,398,052**

FOR THE YEAR ENDED 31ST MARCH 2002

PAYMENTS	Current Year	Previous Year
I. Expenses		
(a) Establishment Expenses (Corresponding to Schedule-10)	4,460,974	3,539,645
(b) Administrative Expenses (Corresponding to Schedule-11)	4,967,081	3,388,591
II. Payments made against funds for various projects		
(a) Wind Resource Assessment Project - 2000-2001	147,826	1,648,693
(b) North-Eastern Project	150,000	100,000
(c) Wind Resource Assessment Project - 2001-2002	1,936,138	-
(d) Micro-survey & preparation of Master Plan	1,020,000	2,100,970
(e) Advance for execution of projects	382,062	-
III. Investment and Deposits made		
IV. Expenditure on Fixed assets & Capital Work-in-Progress		
(a) Purchase of Fixed assets	2,738,436	3,903,287
(b) Expenditure on Capital Work-in-progress	3,107,855	-
(c) Advance on capital account	4,899,418	-
V. Refund of Surplus Money		
(a) Balance of Grants-in-aid to Government of India	154,237	-
VI. Other Payments		
(a) Refund of security Deposits	7,200	49,425
(b) Expenditure on Consultancy Projects	25,343	15,483
(c) Advance & Deposits	6,995	180,833
(d) Dues from MNES	-	126,651
(e) Prior period expenses	7,592	-
(f) Advance to sub-contract services	269,000	-
(g) Advance to Group Gratuity Trust	5,000	-
VII. Closing Balances		
(a) Cash in hand		
(b) Bank Balances		
i) In Current Account	2,912,054	5,743,304
ii) In Deposit Accounts	2,600,000	2,600,000
(c) Stamps on hand	1,202	1,170
TOTAL	**29,798,413**	**23,398,052**

For Centre for Wind Energy Technology

As per our Report attached
For K. Gnananandulu & Co.,
Chartered Accountant

A. JAYARAMAN	M.P. RAMESH	S.S. DAWRA	K. NARASIMHAM
General Manager(F&A)	Executive Director	President / Chairman	Partner

Place : Chennai
Date : 03.09.2002

SCHEDULES FORMING PART OF BALANCE SHEET AS AT 31ST MARCH, 2002

(Amount in Rs.)

SCHEDULE 1 - CORPUS / CAPITAL FUND :	Current Year	Previous Year
Capital Fund (Grants-in-Aid)		
Balance as at the beginning of the year	23,023,751	14,964,420
Add : Grants-in-Aid received	15,000,000	12,460,000
Add: Grants received in kind (DANIDA)	-	3,847,878
Less: Transferred to capital reserve	5,932,922	-
Less: Grants for sponsored projects	2,959,057	-
Less: Book value of Assets sold	7,696	-
Less: Excess of expenditure over income	8,899,350	8,248,547
Balance at the end of the year (A)	**20,224,726**	**23,023,751**
Corpus Fund		
Balance at the beginning of the year	1,990,199	-
Add: Additions during the year	-	1,990,199
Less: Transfer to General Reserve	1,990,199	-
Balance at the end of the year (B)	**-**	**1,990,199**
SCHEDULE 2 - RESERVES AND SURPLUS		
Capital Reserve :		
Transfer from Capital Fund	5,932,922	-
General Reseve :		
Transfer from Corpus Fund	1,990,199	-
Addition during the year	920,751	-
TOTAL	**8,843,872**	

SCHEDULES FORMING PART OF BALANCE SHEET AS AT 31ST MARCH, 2002

(Amount in Rs.)

SCHEDULE 3 - CURRENT LIABILITIES AND PROVISIONS:	Current Year	Previous Year
A. CURRENT LIABILITIES		
Sundry Creditors for expenses	754,065	531,084
Advances Received	2,088,980	1,499,893
Statutory Liabilities	148,834	7,159
Other Current Liabilities	139,178	387,581
TOTAL (A)	**3,131,057**	**2,425,717**
B. PROVISIONS		
Accumulated Leave Encashment	146,320	67,875
TOTAL (B)	**146,320**	**67,875**
TOTAL (A + B)	**3,277,377**	**2,493,592**

SCHEDULES FORMING PART OF BALANCE SHEET AS AT 31ST MARCH 2002

SCHEDULE - 4 FIXED ASSETS

(Value in Rs.)

Description of Assets	As on 01.04.01	Gross Block			Depreciation				Net Block	
		Addn.	Deln. 31.03.02	As on 31.03.02	Upto 31.03.01	For 2001-02	Deln.	Upto 31.03.2002	As on 31.03.2002	As on 31.03.2001
Land	163,170	-	-	163,170	-	-	-	-	163,170	163,170
Furniture & Fittings	892,928	597,189	200	1,489,917	62,616	164,725	26	227,315	1,262,602	830,312
Instruments & Equipment	12,813,446	580,577	2,728	13,391,295	1,264,213	1,735,202	-	2,999,415	10,391,880	11,549,233
Computers	1,704,054	598,725	502	2,302,277	162,665	1,223,685	-	1,386,350	915,927	1,541,389
Vehicles	977,125	2,471	5,300	974,296	89,217	194,707	1,008	282,916	691,380	887,908
Infrastructure facilities	3,199,782	1,345,753		4,545,535	92,786	420,690	-	513,476	4,032,059	3,106,996
Total	**19,750,505**	**3,124,715**	**8,730**	**22,866,490**	**1,671,497**	**3,739,009**	**1,034**	**5,409,472**	**17,457,018**	**18,079,008**
Add: Capital Work in Progress	-	-	-	-	-	-	-	-	3,107,855	-
	19,750,505	**3,124,715**	**8,730**	**22,866,490**	**1,671,497**	**3,739,009**	**1,034**	**5,409,472**	**20,564,873**	**18,079,008**
Previous Year figures	**12,495,087**	**9,365,534**	**-**	**19,750,505**	**582,765**	**1,088,732**		**1,671,497**	**18,079,008**	**-**

SCHEDULES FORMING PART OF BALANCE SHEET AS AT 31ST MARCH, 2002

(Amount in Rs.)

	Current Year	Previous Year
SCHEDULE 5 - CURRENT ASSETS, LOANS & ADVANCES		
A. CURRENT ASSETS:		
Inventories		
Stock of stationeries	27,240	28,350
Cash Balances in hand		
Stamps in hand	1,202	1,170
Bank Balances:		
With Scheduled Banks:		
– On Current Account	2,912,054	5,743,304
– On Deposit Account	2,600,000	2,600,000
TOTAL (A)	**5,540,496**	**8,372,824**
B. LOANS, ADVANCES AND OTHER ASSETS		
Advances and other amounts recoverable in cash or in kind or for value to be received:		
a) On Capital Account	4,899,418	-
b) Prepayments	54,223	18,884
c) Receivable from TNEB	218,868	-
d) Deposits	57,400	53,400
e) Others	1,009,201	511,024
Income Accrued:		
On Deposits with Bank	1,496	1,496
TOTAL (B)	**6,240,606**	**584,804**
TOTAL (A + B)	**11,781,102**	**8,957,628**

SCHEDULES FORMING PART OF INCOME & EXPENDITURE ACCOUNT FOR THE YEAR ENDED 31ST MARCH 2002

(Amount in Rs.)

	Current Year	Previous Year
SCHEDULE 6 - INCOME FROM SALES / SERVICES		
Income from Services		
Fees for Professional and Consultancy Services	3,125,000	1,750,000
Energy receipts	1,313,210	-
TOTAL	**4,438,210**	**1,750,000**
SCHEDULE 7 - INCOME FROM PUBLICATION		
Sale of Books & Reports	241,200	151,600
Receipts from processing and handling Time-series data	153,200	120,900
TOTAL	**394,400**	**272,500**
SCHEDULE 8 - INTEREST EARNED		
On Term Deposits		
- With Scheduled Banks	708,254	309,247
TOTAL	**708,254**	**309,247**
SCHEDULE 9 - OTHER INCOME		
Insurance claims	6,866	-
Miscellaneous Income	34,112	4,311
TOTAL	**40,978**	**4,311**
SCHEDULE 10 - ESTABLISHMENT EXPENSES		
Salaries and Allowances	4,101,545	3,268,236
Bonus & Ex-gratia	38,034	23,590
Contribution to Provident Fund	305,455	58,181
Contribution to pension & gratuity	168,624	73,122
Staff Welfare Expenses	-	6,000
Medical Reimbursement	47,433	31,208
TOTAL	**4,661,091**	**3,460,337**

SCHEDULES FORMING PART OF INCOME & EXPENDITURE FOR THE YEAR ENDED 31ST MARCH, 2002

(Amount in Rs.)

	Current Year	Previous Year
SCHEDULE 11 - OTHER ADMINISTRATIVE EXPENSES		
Labour Hiring Charges	373,430	301,103
Electricity and Power	135,133	90,666
Water charges	29,950	10,164
Insurance	34,304	10,469
Repairs and maintenance	236,155	102,728
Rent for Office building & Guesthouse	516,468	492,300
Vehicles Running and Maintenance	176,791	85,189
Postage & Courier	80,944	45,330
Telephone and Communication charges	441,095	399,782
Printing and Stationery	330,206	134,311
Travel and Conveyance	1,557,310	941,284
Expenses on Seminar & Meetings	263,836	77,182
Expenses on Books, Data & Periodicals	121,736	138,744
Expenses on Fees (Sitting Fees & Honorarium)	55,000	24,600
Auditors Remuneration	22,312	24,150
Hospitality Expenses	97,120	83,288
Professional Charges	29,400	27,400
Advertisement and Publicity	280,799	81,757
Training and Development	161,396	47,434
Office expenses & maintenance	76,460	111,503
Guest house maintenance	53,586	25,730
Expenses on consultancy project	20,344	171,085
Deferred Revenue Expenditure written off	-	177,543
Other expenses	28,190	260,906
TOTAL	**5,121,965**	**3,864,648**

SCHEDULES FORMING PART OF INCOME & EXPENDITURE ACCOUNT FOR THE YEAR ENDED 31ST MARCH, 2002

(Amount in Rs.)

	Current Year	Previous Year
SCHEDULE 12 - PRIOR PERIOD EXPENSES		
Advertisement charges		176,866
Professional charges		500
Bonus & Ex-gratia		3,323
Reimbursement of Newspaper charges	171	-
Electricity charges	7,237	-
Calibration charges	7,300	-
Expenses on painting	30,784	-
	45,492	**180,689**
Less: Excess provision of Gratuity & Pension	7,116	-
TOTAL	**38,376**	**180,689**

SCHEDULE 13: SIGNIFICANT ACCOUNTING POLICIES

1. General information

1.1 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.

1.2 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.

1.3 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.

2. Accounting Convention

2.1 The financial statements are prepared on the basis of historical cost convention and on the accrual method of accounting.

2.2 The income on consultancy / professional projects has been accounted on the year in which the project is completed.

3. Fixed Assets

3.1 Fixed Assets are stated at cost of acquisition inclusive of inward freight, duties and taxes and incidental and direct expenses related to acquisition.

3.2 Fixed Assets received by way of non-monetary grants are capitalized at values stated, by corresponding credit to Capital Reserve.

4. Depreciation

4.1 Depreciation is provided on straight-line method as per rates specified in the Income-tax Act, 1961.

4.2 In respect of additions to / deductions from fixed assets during the year, depreciation is considered on pro-rata basis.

4.3 No depreciation is charged on the fixed assets received by way of non-monetary grants.

5. Grants-in-Aid from Government

5.1 Grants-in-aid from Government are accounted on realization basis.

5.2 Grants-in-aid received during the year from Government has been accounted under the head "Capital Fund".

6. Foreign Currency Transactions

6.1 Transactions denominated in foreign currency are accounted at the exchange rate prevailing at the date of the transaction.

7. Retirement Benefits

7.1 Gratuity liability for the employees of C-WET are covered under the Group Gratuity policy with Life Insurance Corporation of India. The premium paid towards the policy is charged off to revenue.

7.2 Provision towards Gratuity and Pension for the employees who are on deputation has been remitted / provided as per terms and conditions of deputation.

7.3 Provision for accumulated leave encashment to the employees is accrued and computed on the assumption that employees are entitled to receive the benefit at the year end.

7.4 Contributory Provident Fund Account of the employees of C-WET are maintained at the Office of the Regional Provident Funds Commissioner, Chennai. The contribution paid as per Act is charged off to revenue.

7.5 Provision for Non-productivity Linked Bonus has been provided based on the rules applicable for Autonomous Institutions.

8. Uniform Format of Accounts for Central Autonomous Bodies.

8.1 The accounts are prepared based on the Uniform Format of Accounts for Central Autonomous Bodies from the year 2001-2002.

8.2 In order to suit the requirements of Uniform Format of Accounts for Central Autonomous Bodies, the previous year accounts are regrouped / reclassified wherever considered necessary to make them comparable with current year's figures.

9. As desired by the Ministry of Non-Conventional Energy Sources, Government of India, the salary expenditure are being met from the internal resources generated by C-WET. The balance of revenue after meeting the salary component is transferred to General Reserve Fund.

SCHEDULE 14: NOTES FORMING PART OF ACCOUNTS

1. Contingent liabilities:

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

2. Capital commitments:

Estimated value of contracts remaining to be executed on Capital Account and not provided for (net of advance) Rs. 286.99 lakhs (previous year NIL)

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. The value of land is yet to be ascertained. The construction

management of the construction of the campus is entrusted with CPWD. A sum of Rs. 70 lakhs has been deposited to start the construction activities. The expenses incurred for architect, earth-filling etc., are accounted under Capital Work-in-Progress. The balance amount of deposits has been accounted under the head Advance to Capital Accounts.

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. The value of land is yet to be ascertained. 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. The construction management of the construction of the office-cum-workshop is entrusted with CPWD. A sum of Rs. 7.20 lakhs has been deposited to start the construction activities. The expenses incurred for construction is accounted under Capital Work-in-Progress. The balance amount of deposits has been accounted under the head Advance to Capital Accounts.

3. Current Assets, Loans and Advances:

In the opinion of the management the current assets, loans and advances have a value on realization in the ordinary course of business, equal at least to the aggregate amount shown in the Balance Sheet.

4. Taxation:

In view of there being no taxable income under the Income Tax Act, 1961, no provision for income tax has been considered necessary.

5. Foreign Currency Transaction:

Expenditure in Foreign Currency (towards calibration of scientific instruments and purchase of wind farm software): Rs. 2.80 lakhs (previous year NIL).

A sum of Rs. 5.81 lakhs has been received from RISO, Denmark in Foreign Currency towards reimbursement of travel expenses incurred for imparting training for execution of Wind Turbine Test Station at Kayathar.

6. Remuneration to Auditors:

As Auditors	Rs.	12,600/-
As tax audit	Rs.	2,100/-
For Services	Rs.	1,050/-
For Certification	Rs.	6,562/-

7. Financial Statement for the year 2001-2002 has been prepared based on the Uniform Format of Accounts for Central Autonomous Organisations. Due to the above, the following adjustments were made in the accounts of the Current Year.

   i. The value of instruments worth Rs. 59,32,922/- received by way of non-monetary grants credited in the Capital Fund Account transferred to Capital Reserve.

   ii. Corpus Fund Account of Rs. 19,90,199/- transferred to General Reserve Account.

   iii. Excess of expenditure over income transferred to Capital Fund Account.

   iv. The depreciation has been revised from the rates prescribed under Schedule XIV of the Companies Act, 1956 to rates prescribed under Income Tax Act, 1961. The effect of change (increase) is Rs. 21.34 lakhs.

   v. Expenditure of Rs. 4,40,122/- incurred on partition accounted under the head Deferred Revenue Expenditure transferred to Furniture and Fittings Account and Rs. 30,784/- incurred for painting of the building (since vacated) transferred to Prior Period Adjustment Account.

8. The project assets of book value of Rs. 7,696/- (after depreciation of Rs. 1,034/-) have been sold for Rs. 25,400/-. As the entire sale of value of Rs. 25,400/- has been remitted to Government of India, the book value has been adjusted against Grants-in-aid.

9. The Ministry of Non-Conventional Energy Sources vide letter no. 51/18/2000-WE(PG) dt. 05.07.2002 permitted to retain the sale proceeds of Wind Energy Resource Survey data, Handbook and Micro-survey reports and accordingly the same have been accounted under the head income. The number of Handbook on Wind Energy Resource Survey in India and Micro-survey reports are available in stock as on 31.03.2002 is 900 (Volume-V: 348; Volume-VI: 151 and Micro-survey reports: 401).

10. The value of fixed assets as on 31.03.2002 in different locations are furnished below:

GROSS VALUE OF ASSETS **(Value in Rs.)**

Sl. No.	Description of Assets	C-WET Chennai	WTTS Kayathar	WRA Projects	Total
1	Land	-	163,170	-	**163,170**
2	Furniture & Fittings	1,403,115	36,352	50,450	**1,489,917**
3	Instruments & Equipment	1,708,681	6,083,185	5,599,429	**13,391,295**
4	Computers	2,243,473	6,200	52,604	**2,302,277**
5	Vehicles	491,014	472,582	10,700	**974,296**
6	Infrastructure facilities	-	4,545,535	-	**4,545,535**
	Total	**5,846,283**	**11,307,024**	**5,713,183**	**22,866,490**

NET VALUE OF ASSETS

(Value in Rs.)

Sl. No.	Description of Assets	C-WET Chennai	WTTS Kayathar	WRA Projects	Total
1	Land	–	163,170	–	**163,170**
2	Furniture & Fittings	1,189,857	32,172	40,573	**1,262,602**
3	Instruments & Equipment	1,263,956	6,052,728	3,075,196	**10,391,880**
4	Computers	909,900	2,039	3,988	**915,927**
5	Vehicles	311,630	373,146	6,604	**691,380**
6	Infrastructure facilities	–	4,032,059	–	**4,032,059**
	Total	**3,675,343**	**10,655,314**	**3,126,361**	**17,457,018**
7	Capital Work in progress	2,482,855	625,000	–	**3,107,855**
		6,158,198	**11,280,314**	**3,126,361**	**20,564,873**

11. The balance of revenue of Rs. 9,20,751/- (55,81,842 – 46,61,091) after meeting the establishment expenditure (salary component) is transferred to General Reserve Account.

12. The details of utilization of Grants-in-aid received from Government of India are furnished below:

(Value in Rs.)

Details	Balance as on 01.04.01	Receipts	Utilized	Re-funded	Balance as on 31-03-2002
Wind Resource Assessment Project	1,78,032	–	1,47,825	30,207	–
Micro-Survey	49,030	–	–	49,030	–
North-Eastern Project	–	2,25,000	1,50,000	75,000	–
Central financial assistance for C-WET	39,31,443	150,00,000	1,89,31,334	–	109
Total	**41,58,505**	**152,25,000**	**1,92,29,159**	**1,54,237**	**109**

The details of utilization of Central Financial Assistance are:

Execution of Wind Energy Assessment Project	19,36,138
Micro-Survey and Preparation of Master Plan	10,20,000
Advance for execution of projects	3,82,062
Administration expenses	49,67,081
Capital Expenditure	1,07,45,709
Advances & Deposits	6,995
Total	**1,90,57,985**
Less: Dues received from MNES	1,26,651
Central financial assistance utilized	**1,89,31,334**

13. The share of energy receipts entitled to C-WET as per agreements entered into with the client-manufacturers has been accounted at the rates (Rs. 2.70 per Unit) prescribed in Power Purchase Agreement. The share of energy receipts entitled to client-manufacturers will be accounted as and when received.

14. The reference books, data, standards and maps valued for Rs. 3,08,922/-, fully charged to the revenue in the respective years, is available in different units as on 31.03.2002

15. The figures shown in the accounts are rounded off to the nearest rupee.

16. Schedule 1 to 14 are annexed to and form an integral part of Balance Sheet as at 31st March, 2002 and Income and Expenditure Account for the year ended on the date.

Signatures to Schedule 1 to 14

For Centre for Wind Energy Technology

As per our Report attached
For K. Gnananandulu & Co.,
Chartered Accountant

A. JAYARAMAN	**M.P. RAMESH**	**S.S. DAWRA**	**K. NARASIMHAM**
General Manager(F&A)	Executive Director	President / Chairman	Partner

Place : Chennai
Date : 03.09.2002

APPENDIX - 3
Vide Para 2.2

LIST OF 219 POTENTIAL SITES FOR WIND POWER PROJECTS IN THE COUNTRY

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			Data available in WERS vol.
			Deg.	Min.	Deg.	Min.		Measured at 20/25m	Extrapolated at 30m	Measured at 20/25m	Extrapolated at 30m	Extrapolated at 50m	
TAMIL NADU													
1	1	Achankuttam +	8	57	77	28	120	18.60	20.00	270	335	437	V
2	2	Alagiyapandiyapuram +	8	56	77	39	85	20.90	22.30	301	371	487	II
3	3	Andhiyur *	10	36	77	11	380	19.10	20.60	177	213	271	V
4	4	Andipatti +	10	0	77	33	320	19.00	19.60	266	298	346	I
5	5	Arasampalayam	10	51	77	3	370	20.50	21.80	195	232	291	III
6	6	Ayikudy +	9	0	77	21	182	21.40	23.50	305	390	536	II
7	7	Edayarpalayam +	10	55	77	7	445	22.40	23.80	273	323	398	III
8	8	Ennore +	13	16	80	19	6	19.30	20.80	139	177	243	V
9	9	Gangaikondan *	8	51	77	35	60	18.40	19.00	246	267	338	V
10	10	Kannankulam *	8	12	77	35	20	21.30	22.20	238	268	375	V
11	11	Kattadimalai	8	14	77	33	90	23.70	25.30	312	380	488	II
12	12	Kayattar - I	8	58	77	44	94	20.30	21.50	294	342	413	I
13	13	Kayattar - II *	8	57	77	43	105	20.50	20.90	285	302	356	V
14	14	Kethanur	10	54	77	13	403	21.10	22.30	259	305	376	III
15	15	Kumarapuram *	8	16	77	35	80	22.00	22.70	288	315	408	IV
16	16	Mangalapuram	9	3	77	22	190	22.30	23.40	312	357	423	V
17	17	Meenakshipuram	9	52	77	18	290	16.40	17.50	224	267	334	I
18	18	Mettukadai +	10	52	77	23	348	18.00	19.20	184	221	281	III
19	19	Muppandal	8	16	77	33	100	25.50	27.60	406	519	712	I
20	20	Myvadi +	10	36	77	19	341	19.60	21.00	251	305	376	V
21	21	Naduvakkurichi +	9	7	77	30	160	16.80	18.00	157	190	244	IV
22	22	Nettur *	8	54	77	33	100	19.90	20.20	338	358	419	IV
23	23	Onamkulam * +	8	57	77	51	100	19.90	20.30	247	258	292	IV
24	24	Ottapidaram +	8	54	78	1	40	18.50	20.00	221	280	292	IV
25	25	Ovari +	8	18	77	53	39	18.20	19.20	160	184	378	VI
26	26	Panakudi	8	19	77	33	140	22.90	23.90	366	408	469	V
27	27	Pongalur +	10	58	77	21	388	19.10	20.40	213	251	309	III
28	28	Poolavadi +	10	44	77	17	321	21.20	23.00	283	343	445	I
29	29	Poosaripatti * +	10	40	77	7	380	19.30	20.00	168	188	254	IV
30	30	Puliyamkulam +	8	19	77	44	40	18.90	20.80	188	245	343	I

31	31	Pushpathur 2 *	10	33	77	25	340	16.09	17.11	128	151	254	-
32	32	Rameswaram	9	17	79	20	4	23.90	26.40	290	398	604	II
33	33	Sankaneri * +	8	12	77	40	28	22.60	23.40	258	287	388	V
34	34	Sembagaramanpudur	8	16	77	31	40	21.70	23.00	300	367	476	I
35	35	Servallar Hills	8	42	77	21	312	17.80	18.90	207	247	313	-
36	36	Sultanpet	10	52	77	11	380	19.00	19.10	203	204	206	I
37	37	Talayathu	8	48	77	40	105	20.50	21.50	324	364	422	II
38	38	Thannirpandal	10	57	77	19	400	18.20	21.00	216	330	>330	V
39	39	Tuticorin	8	50	78	8	3	17.60	19.00	148	185	245	I
40	40	Vakaikulam	8	45	78	0	39	16.60	17.90	167	201	256	VI
GUJARAT													
41	1	Adesar	23	33	70	57	41	15.60	18.60	93	156	307	II
42	2	Amrapar (GIR) +	21	11	70	25	140	19.67	21.29	147	186	241	VI
43	3	Amrapar (SETH)	21	44	70	3	160	19.17	20.20	151	176	221	VI
44	4	Bamanbore II +	22	26	71	3	200	20.30	21.50	171	199	243	III
45	5	Bayath	22	56	69	11	20	17.65	20.06	118	179	300	VI
46	6	Bhandariya +	22	6	69	43	106	19.50	20.40	162	180	208	IV
47	7	Dhank I	21	48	70	8	175	24.40	25.50	312	353	414	III
48	8	Dhank II +	21	48	70	7	208	25.10	25.50	327	344	367	III
49	9	Gala	22	19	70	5	95	19.76	21.06	175	205	254	VI
50	10	Godladhar	22	3	71	20	242	19.45	22.50	144	216	345	VI
51	11	Haripar +	22	16	69	38	40	20.06	21.19	160	186	210	VI
52	12	Harshad	21	50	69	22	12	20.00	21.40	164	193	239	I
53	13	Jafrabad +	20	54	71	24	20	17.50	19.10	137	176	242	II
54	14	Jamanvada +	23	35	68	36	57	18.60	20.70	149	202	299	IV
55	15	Kalyanpur +	22	3	69	24	80	22.10	23.70	208	253	327	III
56	16	Kera	23	4	69	36	120	19.42	20.41	135	156	172	VI
57	17	Khambada	21	22	71	8	180	17.50	19.10	126	155	204	-
58	18	Kukma +	23	11	69	47	205	19.20	20.60	150	184	239	III
59	19	Lamba	21	54	69	19	20	20.00	21.10	164	191	232	IV
60	20	Limbara	22	32	70	59	160	19.10	20.10	166	190	227	IV
61	21	Mahidad *	22	13	71	8	250	21.50	22.10	178	190	231	-
62	22	Mesaria	22	28	71	6	200	18.78	19.91	131	154	180	VI
63	23	Motisindholi +	23	11	68	43	4	17.50	20.40	118	180	311	II
64	24	Mundra +	22	47	69	43	2	19.50	21.30	168	217	303	II
65	25	Navadra	21	57	69	16	24	20.80	22.40	183	226	297	IV
66	26	Nani Kundal	21	55	71	28	154	20.03	21.90	163	209	278	VI
67	27	Navibander +	21	26	69	47	10	19.50	20.50	153	176	213	II
68	28	Okha +	22	27	69	3	1	19.40	20.60	150	191	260	I
69	29	Okhamadhi	22	6	69	6	12	19.00	20.20	129	159	209	II
70	30	Poladiya	23	6	69	12	120	20.60	22.00	177	215	278	VI

71	31	Ratabhe	22	56	71	2	70	17.50	19.40	123	154	212	VI
72	32	Rojmal	22	1	71	28	140	18.40	21.40	129	188	317	-
73	33	Sanodar +	21	35	72	11	80	22.46	24.19	197	254	373	V
74	34	Sinai	23	3	70	4	57	20.78	21.84	183	207	244	V
75	35	Suvarda	22	23	70	7	90	20.20	21.50	166	196	243	-
76	36	Surajbari +	23	14	70	39	9	19.50	22.00	184	268	444	II
ORISSA													
77	1	Chandipur	21	32	87	1	5	15.18	18.50	120	179	315	I
78	2	Chatrapur	19	18	84	58	9	14.40	16.50	106	158	264	I
79	3	Damanjodi +	18	49	83	0	1325	18.63	19.98	150	187	250	V
80	4	Gopalpur	19	16	84	54	7	16.20	18.10	124	173	265	I
81	5	Paradwip	20	23	86	41	6	18.20	20.10	153	201	289	I
MAHARASHTRA													
83	1	Alamprabhu Pathar * +	16	46	74	22	790	20.50	21.10	164	178	224	VI
84	2	Amberi *	17	36	74	19	960	23.00	23.40	237	246	275	-
85	3	Brahmanwel *	21	10	74	11	600	23.10	23.60	278	289	324	-
86	4	Chakla *	21	19	74	19	380	23.70	24.60	242	270	323	-
87	5	Chalkewadi	17	36	73	49	1160	20.20	20.60	206	211	218	II
88	6	Dhalgaon +	17	8	74	59	810	21.20	21.90	216	234	260	V
89	7	Dongerwadi * +	16	55	74	48	820	21.40	22.20	179	202	284	-
90	8	Gawalwadi	20	6	73	43	740	19.00	21.00	140	189	278	VI
91	9	Gude Panchagani +	17	7	73	59	903	19.80	21.30	178	223	296	IV
92	10	Kamravad *	21	35	74	45	300	18.10	18.70	141	152	205	-
93	11	Kas *	17	44	73	49	1240	20.50	21.20	194	213	277	VI
94	12	Kavadya Donger *	19	1	74	32	910	23.20	23.70	224	236	277	VI
95	13	Khandke +	19	8	74	53	920	19.60	21.30	146	187	250	VI
96	14	Kolgaon * +	18	50	74	43	800	20.50	21.00	177	190	238	VI
97	15	Kotholi +	16	58	73	59	780	17.80	18.10	164	171	180	V
98	16	Lonavla +	18	47	73	23	560	15.50	17.70	122	176	285	II
99	17	Mander Deo *	18	2	73	53	1280	19.40	19.80	153	163	206	VI
100	18	Matrewadi * +	17	12	73	56	898	20.80	21.10	211	218	253	V
101	19	Motha * +	21	24	77	21	1075	18.70	19.10	146	154	179	VI
102	20	Panchagani	17	55	73	48	1372	18.40	19.70	133	160	205	II
103	21	Raipur *	21	2	74	22	500	18.90	19.50	162	173	214	-
104	22	Palsi *	17	20	73	40	970	18.85	19.90	137	164	254	-
105	23	Sautada * +	18	48	75	20	800	21.20	21.90	167	182	223	V
106	24	Takar Mouli *	21	3	73	58	600	20.80	21.10	186	195	224	-
107	25	Thoseghar +	17	35	73	53	1140	21.70	23.30	229	287	489	V
108	26	Vijayadurg +	16	30	73	20	100	19.60	20.60	207	225	253	I
109	27	Vankusawade * +	17	27	73	50	1100	21.20	21.70	231	247	293	VI
110	28	Varekarwadi	17	13	73	59	920	21.04	21.50	257	264	216	VI

ANDHRA PRADESH													
111	1	Badhrampalli Kottala *	14	55	77	24	440	21.30	21.50	248	255	277	V
112	2	Badvel *	14	55	79	6	220	17.95	18.13	170	173	191	-
113	3	Bhimunipatnam +	17	54	83	27	100	19.10	20.10	195	229	282	II
114	4	Banderlapalli *	15	1	78	4	438	20.79	21.60	240	265	320	VI
115	5	Borampalli *	14	30	77	9	550	19.40	20.00	163	176	219	VI
116	6	Burugula *	15	8	77	57	540	18.40	19.10	147	163	216	-
117	7	Chinnababaiyapalli *	13	57	77	37	750	18.50	19.30	132	148	206	-
118	8	Jamalamadugu I *	14	49	78	23	195	17.50	18.30	161	184	265	IV
119	9	Jamalamadugu II * +	14	46	78	22	220	18.60	19.40	165	183	248	IV
120	10	Jangamguntla	15	39	79	8	300	16.03	16.60	149	164	189	-
121	11	Kadavakallu * +	14	48	77	56	340	22.10	22.30	303	308	325	IV
122	12	Kakulakonda	13	43	79	21	981	23.10	25.00	332	404	541	II
123	13	Kondamithipalli * +	15	3	78	3	440	21.22	22.00	252	282	349	VI
124	14	Kodumuru *	15	43	77	45	410	20.83	21.20	225	233	270	—
125	15	Korrakodu *	14	46	77	15	460	18.67	19.35	146	161	220	-
126	16	Lachambavi *	16	27	79	19	280	15.40	17.90	98	150	169	VI
127	17	Madugupalli *	14	42	77	51	440	18.70	19.60	152	175	266	VI
128	18	M.P.R. Dam +	14	54	77	25	450	19.90	20.70	228	245	269	II
129	19	Mustikovala	14	15	77	32	600	20.20	20.80	201	216	237	IV
130	20	Nallakonda * +	14	7	77	34	757	22.80	23.10	276	288	324	V
131	21	Narasimhakonda	14	30	79	52	100	20.10	22.50	186	261	403	II
132	22	Nazeerabad * +	17	11	77	55	664	21.00	21.60	176	189	232	V
133	23	Pampanoor Thanda * +	14	38	77	24	490	19.60	20.10	182	194	232	VI
134	24	Payalakuntla	14	53	79	2	340	20.10	20.40	230	241	257	II
135	25	Puttaparthy *	14	9	77	48	540	17.70	18.00	149	156	174	VI
136	26	Ramagiri – I +	14	17	77	31	667	19.50	20.90	205	246	308	II
137	27	Ramagiri III	14	22	77	32	550	19.40	20.20	190	213	246	IV
138	28	Singanamala	14	46	77	44	469	23.80	24.20	366	377	392	IV
139	29	Tallimadugula *	14	22	77	32	540	22.20	22.50	260	267	288	V
140	30	Talaricheruvu *	14	57	78	3	360	18.11	19.30	144	179	298	-
141	31	Tirumala	13	40	79	22	880	20.40	21.90	226	282	374	II
142	32	Tirumalayapalli +	14	54	78	11	451	19.00	20.80	154	195	285	-
143	33	Ulindakonda *	15	38	77	59	430	17.41	18.30	130	150	182	-
144	34	Vajrakarur +	14	58	77	19	507	19.46	20.90	173	205	243	VI
RAJASTHAN													
145	1	Devgarh * +	24	3	74	39	520	19.88	21.38	151	186	281	VI
146	2	Damotar	24	7	74	44	540	18.80	19.50	149	163	189	VI
147	3	Harshnath *	27	30	75	10	910	20.62	22.60	206	277	617	V
148	4	Jaisalmer +	26	54	70	55	231	17.80	19.50	159	202	274	II
149	5	Jaisalmer 2 *	26	53	70	55	231	19.79	20.74	182	209	311	-

150	6	Jaswanthgad	24	47	73	28	940	18.90	19.40	142	152	166	VI
151	7	Khodal	26	22	71	13	200	17.00	18.50	135	170	229	II
152	8	Mohangarh	27	17	71	13	155	15.50	17.50	117	161	243	III
153	9	Phalodi +	27	7	72	20	260	17.40	19.20	142	185	261	II
LAKSHADWEEP													
154	1	Agathi	10	51	72	11	1	18.40	19.50	179	208	253	III
155	2	Amini	11	7	72	44	4	17.40	-	140	>150	>150	VI
156	3	Bitra	11	35	72	12	4	16.50	19.30	173	258	>258	VI
157	4	Chetlat	11	43	72	43	4	19.00	20.60	170	205	267	VI
158	5	Kadmat	11	13	72	47	1	18.00	19.40	169	211	282	III
159	6	Kalpeni	10	5	73	39	1	16.20	18.90	125	182	302	III
160	7	Kavarathi	10	32	72	38	1	18.00	19.60	161	206	283	III
161	8	Minicoy	8	17	73	4	1	17.40	>17.4	162	>162	>162	IV
KARNATAKA													
162	1	B.B. Hills +	13	26	75	45	1768	26.80	27.60	498	532	581	III
163	2	Bommanahalli	13	17	76	36	940	18.10	19.40	128	151	189	III
164	3	Chalamatti +	15	18	75	3	710	21.40	22.90	189	230	268	VI
165	4	Channavadayanapura *	11	57	76	36	940	20.39	21.24	154	173	243	-
166	5	Chikodi * +	16	25	74	35	769	23.20	23.50	264	272	298	V
167	6	Godekere *	13	20	76	40	978	19.80	19.90	155	157	159	VI
168	7	Gokak +	16	7	74	47	775	19.20	21.40	168	228	336	III
169	8	Hanamsagar +	15	54	76	2	719	20.60	22.10	173	210	270	III
170	9	Hanumanahatti +	15	55	74	43	902	20.30	22.10	165	213	294	III
171	10	Horti * +	17	7	75	44	620	19.80	20.10	173	180	294	V
172	11	Haradenahalli	12	51	76	13	1030	18.50	19.70	127	151	294	IV
173	12	Jogimatti +	14	10	76	24	1120	30.30	31.30	498	553	632	III
174	13	Kappataguda * +	15	15	75	42	979	24.92	25.60	311	334	423	-
175	14	Khanderayanahalli * +	14	30	75	45	629	20.20	20.30	183	185	190	V
176	15	Khamkarhatti * +	15	45	74	35	863	20.30	20.80	159	169	217	V
177	16	Malgatti	15	49	75	54	680	19.60	21.90	156	219	335	III
178	17	Mannikere +	15	58	74	28	925	24.30	25.20	252	278	315	-
179	18	Mavinhunda * +	16	25	74	48	787	22.13	-	212	>212	>212	-
180	19	Ramgad *	15	8	76	27	960	18.24	19.37	134	158	263	-
181	20	Sangundi +	16	15	75	44	625	18.70	20.40	153	193	259	III
182	21	Somadevarahatti	16	53	75	31	620	17.30	18.50	127	150	187	VI
183	22	Arasinagundi	14	29	76	50	-	-	27.00	-	392	>392	-
184	23	Bullenahalli 1	13	25	76	41	-	-	21.20	-	168	>168	-
185	24	Bullenahalli 2	13	24	76	41	-	-	20.34	-	195	>195	-
186	25	Gujanur	14	58	75	54	-	-	23.35	-	240	>240	-
187	26	Jogimatti	14	11	76	25	-	-	31.03	-	582	632	-
188	27	Madikaripura	14	13	76	27	-	-	27.13	-	365	>365	-

189	28	Sogi A	14	55	75	59	U	-	26.56	-	415	>415	-
190	29	Sogi B *	14	54	75	59	890	23.80	24.10	246	255	284	-
191	30	Subramanya Halli *	15	0	76	34	1020	21.13	22.39	214	256	409	
KERALA													
192	1	Kanjicode +	10	47	76	49	130	22.60	23.70	218	249	296	III
193	2	Kailasammedu	9	51	77	10	1160	23.20	24.50	251	300	375	VI
194	3	Kolahalamedu	9	40	76	56	1000	16.90	17.80	146	174	222	IV
195	4	Kotamala	10	40	76	36	150	19.20	20.50	154	187	239	III
196	5	Kottathara	11	7	76	39	750	19.70	20.70	207	243	297	III
197	6	Kulathummedu	9	44	77	13	1040	20.20	22.40	181	237	349	VI
198	7	Kuttikanam	9	35	76	59	1000	16.50	18.00	140	181	243	V
199	8	Nallasingam	11	6	76	44	840	22.90	24.10	324	377	456	-
200	9	Panchalimedu	9	32	76	57	950	20.20	20.90	258	285	327	IV
201	10	Parampukettimedu	9	54	77	12	1160	27.30	29.40	470	553	721	-
202	11	Ponmudi	8	46	77	8	1074	18.50	18.70	216	220	226	III
203	12	Pullikanam	9	44	76	52	1100	18.20	18.50	178	187	200	-
204	13	Ramakalmedu	9	49	77	14	920	29.70	29.70	532	534	535	IV
205	14	Senapathi	9	57	77	11	1240	19.40	21.00	189	244	339	-
206	15	Sakkulathumedu	9	52	77	13	1040	28.55	28.63	531	533	561	-
207	16	Tolanur	10	42	76	30	100	15.70	17.20	115	157	231	III
MADHYA PRADESH													
208	1	Jamgodrani	22	59	76	10	560	18.20	19.70	130	164	222	IV
209	2	Kheda	22	36	75	38	618	18.50	19.70	126	152	192	IV
210	3	Kukru +	21	30	77	28	1118	19.00	20.40	157	194	255	V
211	4	Mahuria * +	23	50	76	6	504	19.00	19.50	171	181	217	V
212	5	Mamatkheda	23	45	75	3	560	20.04	21.49	169	202	255	-
213	6	Nagda *	22	53	76	3	700	22.50	23.50	219	249	371	-
214	7	Sendhva +	21	38	75	3	540	18.10	19.10	163	183	215	V
215	8	Valiyarpani	21	39	74	57	505	18.90	20.10	191	229	287	-
WEST BENGAL													
216	1	Fraserganj *	21	34	88	15	3	17.70	18.25	147	158	196	V
217	2	Ganga Sagar * +	21	37	88	4	3	17.40	18.10	155	173	225	V
ANDAMAN & NICOBAR ISLANDS													
218	1	Keating Point	9	15	92	46	2	16.06	19.01	114	175	>175	VI
UTTARANCHAL													
219	1	Bachelikhal	30	4	78	37	945	18.06	20.01	144	181	244	VI

Note: *** 25 Mast**

+ Master Plan available

Note: Sl. No 22 to 29 in Karnataka with 30m Mast (KPCL & NAL Mast)

APPENDIX - 4
Vide Para 3.2

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	Smt. K. A. Fathima, Additional Director & Head, Power Electronics Groups,	Electronics Research and Development Centre of India, Thiruvananthapuram – 695 033.
6	Dr. S. Rangarajan, Wind Energy Expert	A-41, Industrial Estate II stage, Peenya, Bangalore – 560 058
7	Shri L. E. D'Cruz, Wind Energy Consultant	Enercon (India) Limited, Andheri (West), Mumbai – 400 053.
8	Dr. R. P. Gupta, Wind Energy Expert	Centre for Energy Technology, Osmania University, Hyderabad – 500 007.
9	Executive Director	Centre for Wind Energy Technology, Chennai – 600 101.
10	Shri N.S. Prasad, Unit Chief, (Secretary, RC)	Centre for Wind Energy Technology, Chennai – 600 101.

CENTRE FOR WIND ENERGY TECHNOLOGY

(An Autonomous Institution of Government of India)

Chennai - 600 101.

Notice is hereby given that the Fourth Annual General Meeting of the Members of Centre for Wind Energy Technology (Registration No. 72 of 1998) will be held at Conference Hall, Ministry of Non-Conventional Energy Sources, Block No. 14, C.G.O. Complex, Lodi Road, New Delhi - 110 003 on Wednesday, the 25th day of September, 2002 at 3.30 P.M., to transact the following business:

1. To receive, consider and adopt the Annual Report for the year 2001-2002, audited Balance Sheet as at 31st March, 2002, Receipts 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 2002-2003.

For Centre for Wind Energy Technology

(M.P. Ramesh)
Executive Director

Place : Chennai
Date : 03-09-2002