

वार्षिक रिपोर्ट Annual Report 2013-14



**पवन ऊर्जा प्रौद्योगिकी केन्द्र
Centre for Wind Energy Technology**

An Autonomous R & D Institution, Ministry of New and Renewable Energy, Government of India
नवीन और नवीकरणीय ऊर्जा मंत्रालय, अधीन स्वायत्त अनुसंधान एवं विकास संस्था, भारत सरकार

Annual Report 2013-14



C-WET

ISO 9001 : 2008

CENTRE FOR WIND ENERGY TECHNOLOGY

**An Autonomous Research & Development Institution
Ministry of New and Renewable Energy, Government of India**

Chennai - 600 100 - India

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Executive Director's Report . . .

Centre for Wind Energy Technology (C-WET) proactively plans and executes various programmes within the objectives of the Centre, in the development of wind power sector in the country. Year after year, C-WET's experience has been gainfully sought after by the Industry and all the new Stakeholders including the independent power producers, for C-WET's value added services towards Wind Resource Assessment, feasibility report for wind power projects, wind turbine design evaluation and renewal of certification, wind turbine testing as per the International standards, multi-institutional research programmes in wind energy development and deployment in the Industry. C-WET also actively participates in the implementation of wind power development guidelines to ensure orderly development of wind power sector in the Country, with India having 5th position in the World with an wind power installed capacity crossing 20 GW as of now. In addition, C-WET has been implementing on a mission mode Solar Radiation Resource Assessment (SRRA) all over the Country by having installed 119 real time networked SRRA monitoring stations.

Wind Resource Assessment, Micrositing, Due-diligence Analysis of wind power projects, feasibility and Detailed Project Report (DPR) preparation, Wind Turbine Testing, Certification, Evaluation of Certificates, Research and Development with institutional collaboration, preparation of standards, release of Revised List of Models and Manufacturers of Wind Turbines (RLMM), empanelment list of Small Wind Energy Systems (SWES) and their field performance testing are some of the highlights of C-WET's activities. Significant efforts have been initiated by C-WET through research proposal as well as National and International training programmes sponsored by Indian Technical & Economic Cooperation/Special Commonwealth Assistance for Africa Programme (ITEC/SCAPP) Ministry of External Affairs (MEA) in imparting the much needed training and human resource development for the wind energy industry of India. With the SRRA mission mode project executed by C-WET, it contributes to research in other renewable energy areas as assigned by Ministry of New and Renewable Energy (MNRE); concerted C-WET efforts towards initiation of Indian Offshore Wind Resource Assessment Project at Dhanushkodi, finalizing Offshore Policy, modernizing resource assessment merging latest Information Technology and Communication techniques along with research infrastructure development at Kayathar and Chennai are special developments in this year.



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During the year 2013-14 the significant activities by the various Units are as under:

Research and Development

As wind power penetration in the overall electrical energy mix is increasing in India, there is a need for developing techniques of seamless grid interfacing of wind power ensuring power quality in the grid. C-WET has completed two projects during this period to meet the above goals. In power evacuation studies for grid integrated conversion systems, a three year project has been completed and the research report has been made public by hosting on the Centre's website. In power quality issues, remedial measures have been suggested for the field measured power quality issues and studied through numerical simulations in the laboratory. It also suggested the need for power conversion and features like Low Voltage Ride Through (LVRT) and reactive power reduction so that the power factor is closed to unity. Three successive empanelment lists for SWES has been released during the period on the website.

Wind Resource Assessment

Wind resources have been measured at 789 locations till 31.03.2014 cumulatively and 237 stations have been found to have wind power density (WPD) in excess of 200 W/m² at 50 m above ground level. Over 108 consultancy projects involving micro-siting, verification of data collection procedure and for preparation of due diligence reports. 11 new monitoring stations have been installed under various consultancy projects. The commissioned 100m tall guyed mast for Offshore Wind Resource Assessment at Dhanuskodi, has been instrumented for multilevel wind and meteorological measurements and the data is being acquired in C-WET's server through Internet since October, 2013. Wind shear measurement with 120m tall mast at Kayathar has been commissioned and dedicated to the Nation by the Secretary, MNRE. As on March 2014, 157 wind monitoring stations are in operation in 17 States and 1 Union Territory (including 82 stations currently commissioned). All the commissioned stations have been connected to a real time network for wind data, which is updated every second in C-WET server,

To overcome the infirmity of wind power, forecasting and scheduling is the need of the hour, C-WET has already been working with Riso, Denmark with their “prediktor” model; Vortex Corporation, Spain to develop and fine tune a forecasting model for India through Indo-Spanish collaboration; sharing data for complex terrain modeling with National Renewable Energy Laboratory (NREL), USA, under C-WET- NREL, Indo-US Collaboration.

Wind Turbine Testing

The test facility at WTTS, Kayathar where Wind Turbine can be tested according to international standards IEC 61400-12-1, 13.1 is equipped to undertake type testing and testing of wind turbines. Four testing agreements have been signed for 1000 kW machine of Xyron Technologies limited, 2000 kW Inox wind limited and 700 kW, 1700 kW of Garuda Vayu Sakthi limited. The unit has



participated in an Inter Laboratory Comparison (ILC) with 18 accredited laboratories under the leadership of NREL under the group IEC TC 88 Certification Advisory Committee (CAC) for test laboratories. A desk top surveillance audit completed to continue the accreditation as per the requirements of IEC/ISO 17025 compliance. Special measurement drive train analysis “Witnessing” at site for Garuda 700 kW WT at Melamaruthappapuram Village, Tirunelveli District has been carried out.

Wind Turbine Research Station

C-WET owned R&D infrastructure machines at WTRS Kayathar comprises of first generation 9 WTGs of 200 kW capacity (22 year old & in operation), one 600 kW constant speed WTG, and one latest generation WTG of 2000kW (variable speed) capacity are kept in operation with continuous monitoring for research on experimental techniques and measurements. The 120m tall mast has been inaugurated during this period by Shri Satish Balram Agnihotri, IAS., Secretary, MNRE.

Standards and Certification

The Unit is implementing TAPS 2000 (amended) for certification of Wind Turbines and completed renewal of certificates for three Wind Turbine models, 2 of M/s RRB Energy and 1 of M/s Southern Wind Farms Limited. Bureau of Indian Standards (BIS) has formulated Wind Turbine sectional committee (ET 42) for preparation of Indian Standards on Wind Turbines under the Chairmanship of Executive Director of C-WET. Based on the contributions, three draft Indian Standards have already been accepted by ET42 committee of BIS for printing and one more draft Indian standard viz., “ETD 42 (6421) Wind turbines Part 13 (Measurement of mechanical Loads)” has been presently finalized and accepted by BIS for printing. Based on the MNRE guidelines, three RLMM lists have been issued after thorough scrutiny of the documentation supplied by the manufacturers for various models marketed in India. The Unit also permitted to certify new proto-type wind turbine models for grid connection as per the revised guidelines dated 22-05-2012 and addendum dated 20-09-2012 by MNRE.

Information, Training and Commercial Services

The Unit had successfully organized two National training programmes (during June & November 2013) and two International courses: during March-April, 2013 and September, 2013 specially sponsored by MEA, GOI under ITEC/SCAAP programme supported by MNRE.

Global Wind Day was celebrated on June 15, with a special lecture on Wind energy development of Tamil Nadu delivered by Shri Rajesh Lakhoni, I.A.S., Principal Secretary, Energy Department, Tamil Nadu. The Foundation Day of C-WET was celebrated on 21st March, Shri Debashish Majumdar, Former CMD, IREDA was the Chief Guest and addressed the gathering.

Solar Radiation Resource Assessment

The operation and commissioning of 51 dedicated automatic SRRA stations, the solar data collection and analysis, including data quality check have been well established and more than two



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years processed data is available for public for development of solar projects. The phase II programme on SRRA involving 60 SRRA Stations and 4 advanced measurement stations have been taken up for execution. During the period, commissioning of 21 SRRA stations have been completed and a calibration laboratory over the roof top of C-WET main building has been established for secondary calibration of sensors. A research study on soiling rate is also in progress.

C-WET actively coordinates with GIZ, Germany for development/modification/upgradation of algorithms for SRRA data quality. Initiated proposal for purchase of long term meso-scale satellite data for preparation of SolMap of India and GIZ is extending services including supply of hardware and software to C-WET for data processing and SolMap preparation.

Engineering Services Division

Facilitates the hi-tech needs of managing ever increasing Information Technology infrastructure involving several Internet/Intranet nodes connected to networked servers with leased lines from Software Technological Parks of India, cyber security and reliable uninterrupted power supply for the computational infrastructure; the civil infrastructure of building premises, air-conditioning and features of renewable energy penetration in day-to-day demand of energy at C-WET, energy auditing and bringing energy efficiency. An UASBAR 50 KLD bio-gas plant has been installed, its byproduct methane gas is now used in C-WET's canteen.

Recognitions/Initiations:

- ♦ ED, C-WET has been conferred by the Energy and Environment Foundation of India, the “Global Excellence Award-2013 in Renewable Energy” for his vision, leadership, outstanding contribution and for demonstrating excellence in the Renewable Energy Sector in the 4th World Renewable Energy Technology Congress Conference in September, 2013.
- ♦ C-WET participated in the deliberations during the on the spot study visit of Standing Parliamentary Committee on energy during this period at Guwahati / Gangtok / Darjeeling / Kolkata & at Madurai.
- ♦ As part of the capacity building at C-WET, Technology Think Tank (TTT) lecture series on every Thursday was organized for the staff and project staff to share their knowledge/experience gained at C-WET.

Dr. S. Gomathinayagam
Executive Director, C-WET



THE CHARTER

The Centre for Wind Energy Technology (C-WET) serves as the technical focal point for wind energy technologies and was established at Chennai during 1998 by the Ministry of Non-Conventional Energy Sources (MNES), presently renamed as Ministry of New and Renewable Energy (MNRE). A Wind Turbine Test Station (WTTS) has also been established at Kayathar, Tamil Nadu, with the technical support and partial financial assistance from Danish International Development Agency (DANIDA), Denmark.

Mission

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

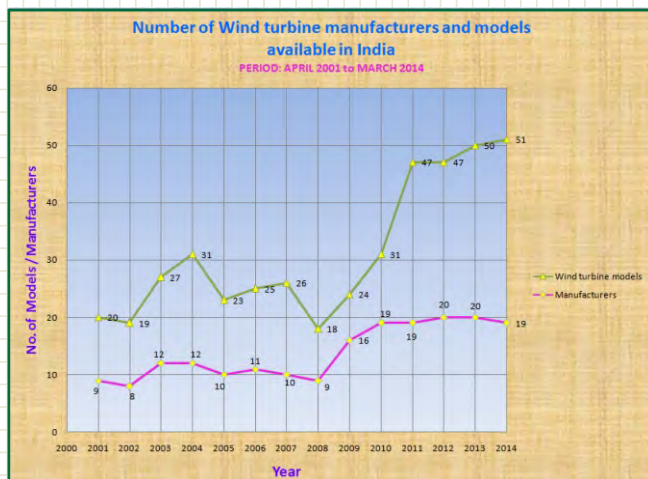
Objectives

- ♦ To serve as the technical focal point for wind power development in India, for promoting and accelerating the pace of utilization of wind energy and support the growing wind power sector in the country.
- ♦ To develop and strengthen the facilities and capabilities, evolve strategies, promote, conduct, co-ordinate and support research and development programmes to achieve and maintain reliable and cost effective technology in wind power systems.
- ♦ To analyze and assess wind resources, based on the data available from various sources and prepare wind energy density maps / wind atlas / reference wind data.
- ♦ To prepare and establish Indian standards on wind turbines and to develop and implement certification system in India.
- ♦ To establish world class facilities, conduct and coordinate testing of complete wind power systems and components according to internationally accepted test procedures and criteria, whereby the total performance that includes power performance, power quality, noise level, dynamics and operation and safety systems is tested according to agreed protocols.
- ♦ To accord type approval/type certification to wind turbines in accordance with Type Approval Provisional Scheme TAPS 2000 (amended).
- ♦ To undertake Human Resource Development programmes for the personnel working in the wind energy sector.
- ♦ To promote commercial exploitation of know-how, know-why results and offer various consultancy services to the customers.
- ♦ To promote the development and commercialization of any other wind energy systems including stand-alone systems.
- ♦ To carry out any other activity in the field of renewable energy for R&D as may be assigned to it by the Ministry of New and Renewable Energy (MNRE) from time to time.

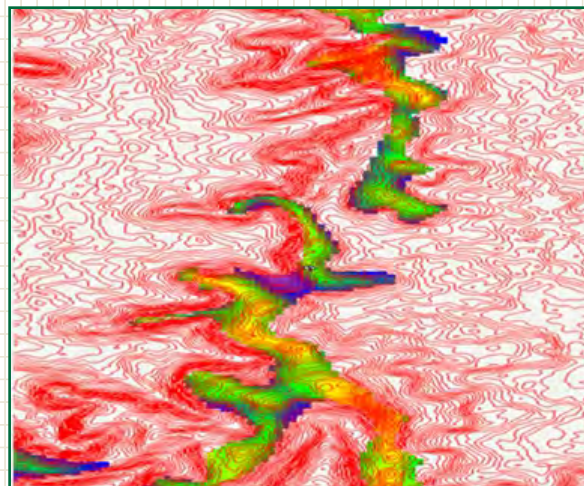


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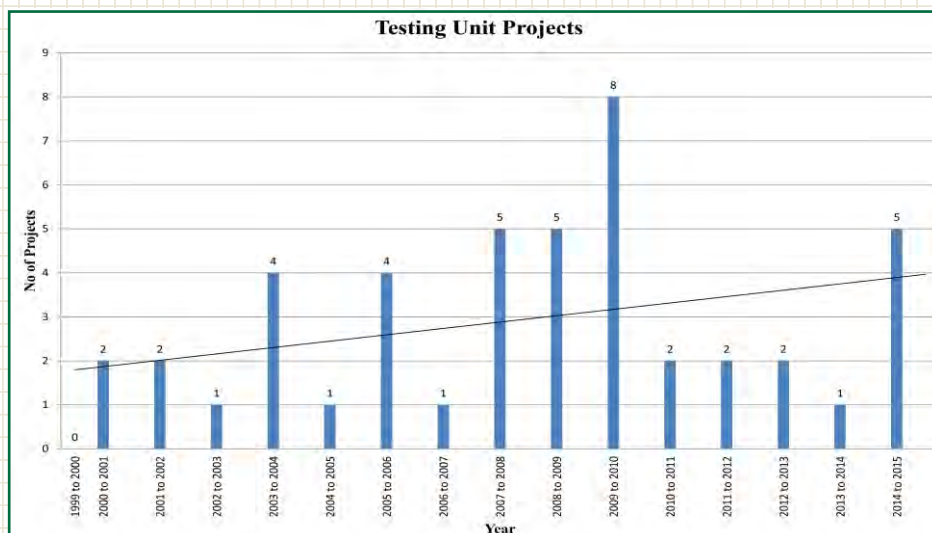
C-WET'S MISSION HIGHLIGHTS



Wind turbine models / Manufacturers RLMM list



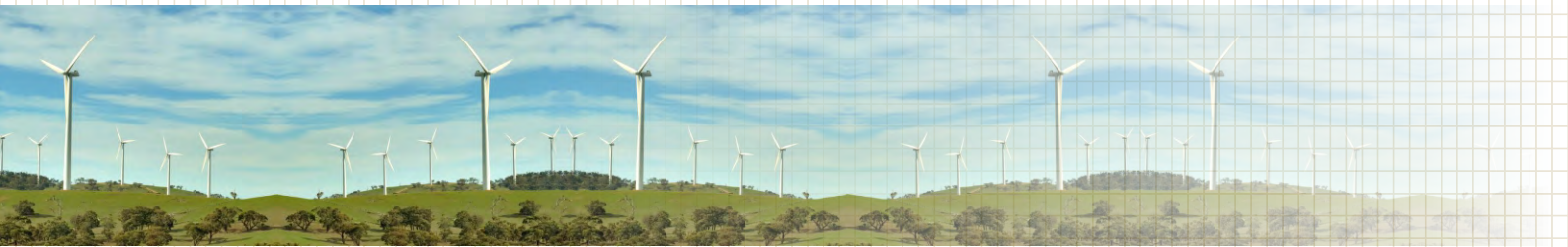
Wind power Density (WPD) Map



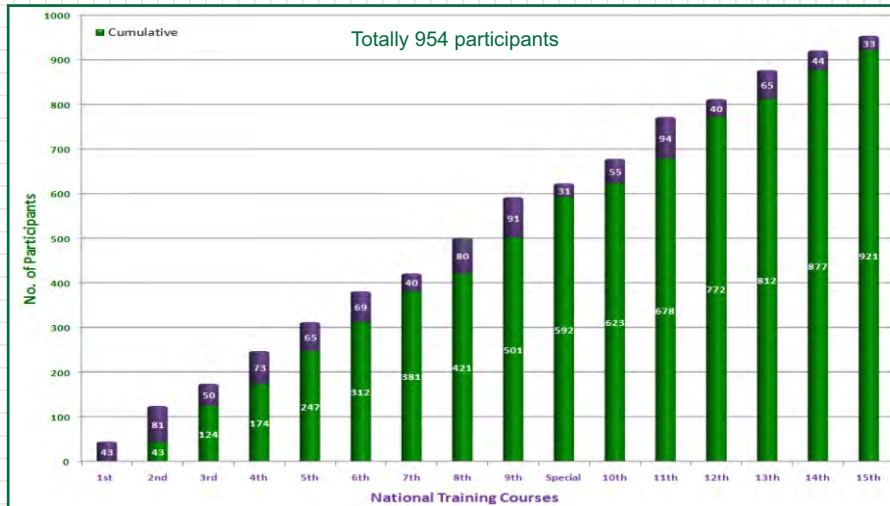
Testing Unit Projects



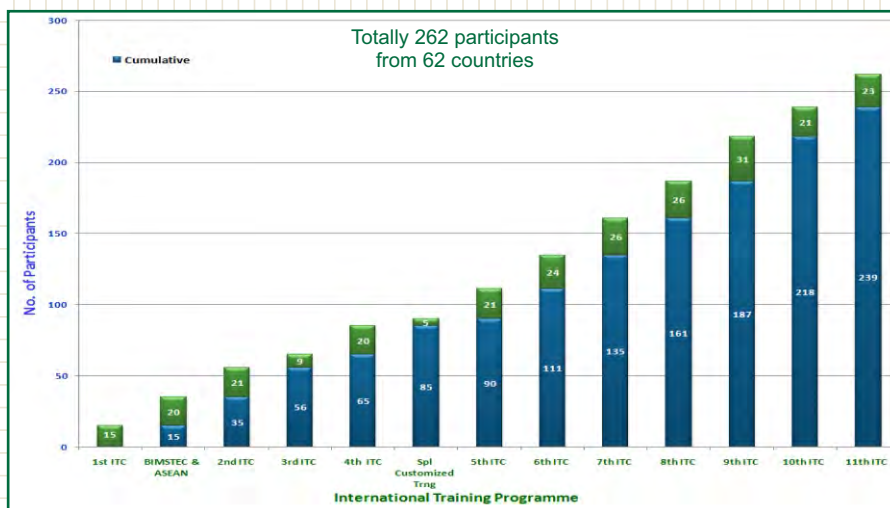
Calibration facility at C-WET, Chennai, Tamil Nadu



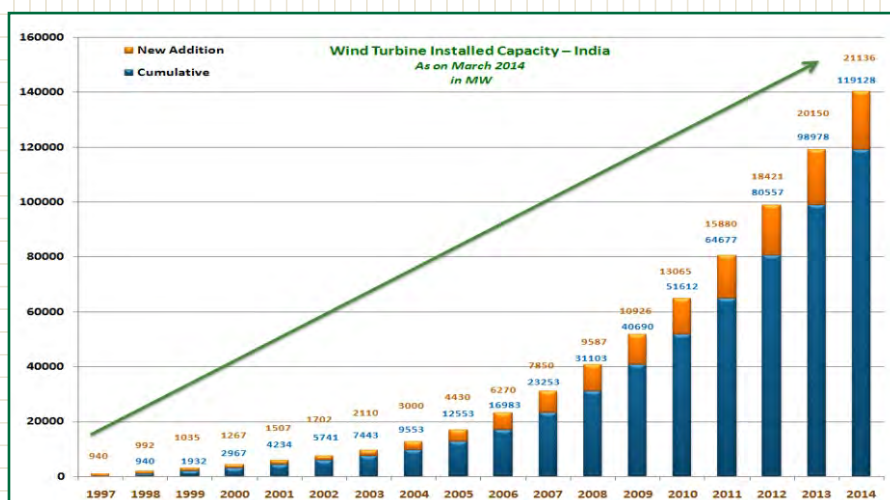
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National Training Courses



International Training Programmes



Wind Turbine Installed Capacity - India as on March 2014 in MW

INNOVATIONS

Comprehensive Health Monitoring 2 MW Wind Turbine

The health/condition monitoring system installed for the drive train and blades on the 2 MW Experimental/Research Wind Turbine at C-WET's Kayathar WTRS facility has started producing data. Work has been started on the fault prediction algorithm that would help identify defects on the drive train and the blades. The measurements from the components would be used to study the dynamics of the system and identify areas of defect/malfunction or deviation in operational characteristics. This defect prediction method of prognosis would in the future become the guiding line for any kind of operation and maintenance activity that the wind industry would want to perform. The preparation of fault prediction algorithm work is underway with the help of IIT Madras.



Condition Monitoring on the drive train



Specially Designed Corrosion Resisting Offshore Wind Mast

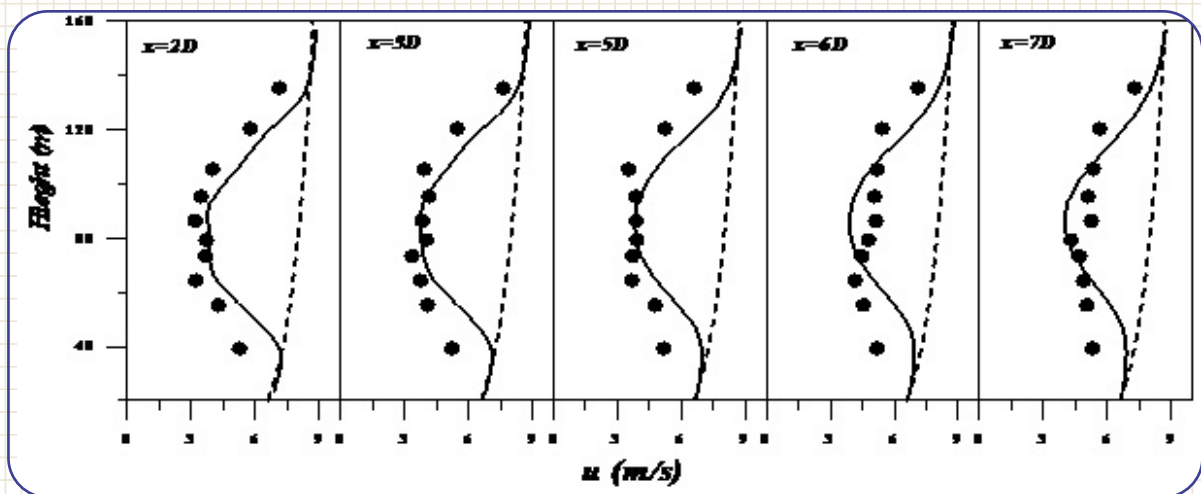
The project has been undertaken with the support from MNRE. The project consists of two parts Synthetic Aperture Radar (SAR) Data collection and analysis for offshore wind potential assessment between Kanyakumari and Rameshwaram and in site wind profile measurements at Dhanushkodi with 100m anemometry. The SAR study has already been completed and the report is indicating regions of offshore wind potential in the southern peninsular India off Tamil Nadu coast. In order to validate the satellite study, a 100m lattice mast has been installed and multilevel wind / met sensors commissioned at the tip of Dhanushkodi, Rameshwaram and the data has been acquired since 1st October 2013 in the C-WET's server through Internet. The on-going physical measurement is expected to confidence regarding the assessed offshore wind potential.

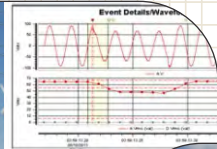


Wind Turbine wake study

Wind farms usually consist of a number of horizontal axis Wind Turbine Generators (WTGs) which are closely spaced in clusters. Each wind turbine in a wind farm slows down the wind behind it as it extracts part of the kinetic energy off the wind and converts it to electricity. The un-extracted energy leaving from the turbine rotor introduces an expanding spiral whirl in the downstream side of the rotor creating a wake i.e. a long trail of wind which is quite turbulent and slowed down, when compared to the incident wind in front of the turbine. The operation of a WTG in a wind farm will inevitably affect the others in its vicinity due to velocity deficit and increased level of turbulence in its wake.

In order to analyze the wake effect of the wind turbine at various wind speeds, a 2.0 MW wind turbine was modelled for simulation and analyzed in the Computational Fluid Dynamics (CFD) Model using various CFD tools and actual wind velocity measurements in the upstream by using Sound Detection and Ranging (SODAR) and downstream of wind turbine at different spacing by using, Light Detection and Ranging (LIDAR). The measured and analytical CFD data are compared. Both the analysis shows that 90% of wind speed can be recovered at the spacing of 7D distances. The details are shown in figure below:



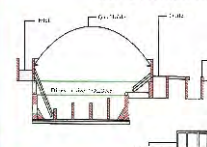


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and installed between 50 and 70 ggs at 3-5 days under and between 2000 and 3000 hr. CSAP PM is 20 ppm. Use 100 ggs at 1000 hr. In full operation, avoid about 100,000 ft. a day. 2000 hr. need for electricity protection for 1000 hr.

સાઇટ વિગત / SITE DETAIL



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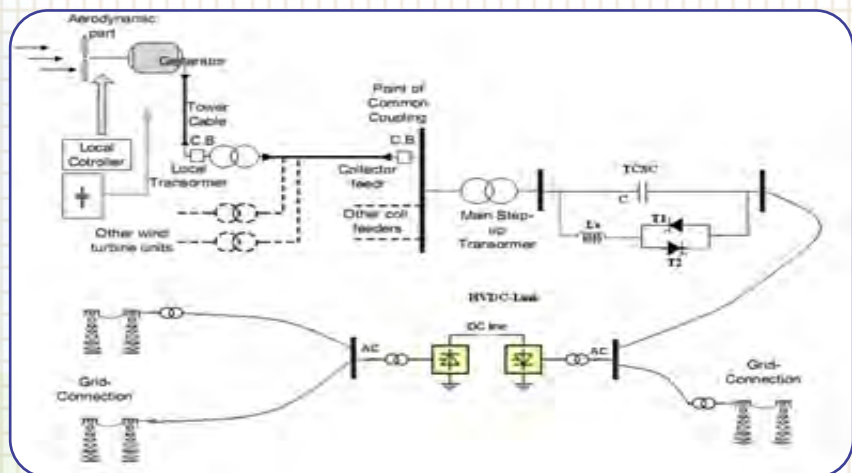
RESEARCH & DEVELOPMENT

R&D Unit supports time bound and mission oriented research & development programmes to achieve world class, reliable and cost effective technology in wind power systems. The Unit continues to strengthen its knowledge and skills through continuous learning to keep pace with state-of-the-art technology and excels through its effective networking with other Academic & Research Institutions. The Unit carries out in-house R&D through networking in research relevant areas with a mutually beneficial interdisciplinary approach for most of the projects. Strategic collaboration that could assist in most suitable technological developments for our Country is nurtured by funding and technical support. Immense pool of knowledge base in the Country and abroad is accessed to meet the goals set. C-WET undertakes R&D projects which are having deliverables useful to the wind Industry in India. The summary of the work executed during the year 2013-14 are provided below:

Completed R&D Projects:

Power Evacuation Studies for Grid Integrated Wind Energy Conversion System

Power evacuation of grid integrated wind energy conversion system is one of the major issues faced by both the Wind turbine industry and Utility, particularly in the Thirunelveli circle in



Block diagram indicating placement of TCSC & VSC based HVDC system



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Tamilnadu, which has a high concentration of wind farms. A project was initiated in association with Anna University aimed at identifying the weak points in the power system to give appropriate recommendations [placement of Thyristor Controlled Series Compensation (TCSC)/Voltage Source Converters (VSC) based High Voltage Direct Current (HVDC)] to improve the power evacuation in this circle. The project has concluded with the following recommendations for effective utilization of installed wind power in Thirunelveli region.

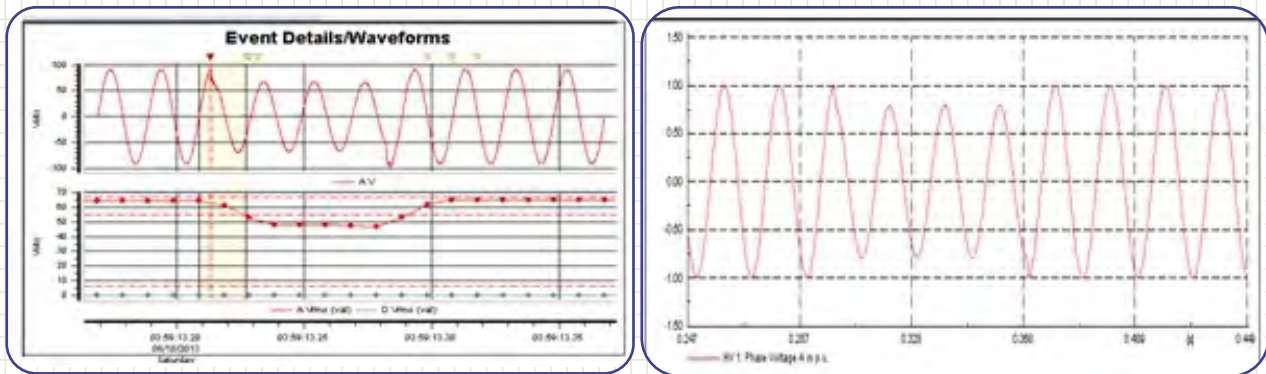
- ◆ When the wind penetration is below 50% the existing transmission corridor is sufficient to evacuate the power. When it is above 50% it is observed that more number of transmission lines and transformers are overloaded. Hence, it is recommended that in order to efficiently utilize the available wind potential it is essential to establish a dedicated 765/400kV and 230 kV substations and necessary committed expansion proposals should be implemented as early as possible in the Tirunelveli region.
- ◆ The real and reactive power losses are increased as wind power penetration increases, so reactive compensation is required at the wind farm substations. Dynamic compensation at the 110 kV/230 kV substations is recommended.
- ◆ The plan for future expansion of wind turbine generators may be covered near the strong points identified in the grid.
- ◆ Weak points identified using short-circuit analysis are prone to power evacuation problem in case of increasing wind turbine generator installation.
- ◆ The transmission expansion plans in the pipe line may have a provision for installation of TCSC, as it enhances the loading of the transmission lines.
- ◆ To overcome the technical difficulties like alleviation of line over loading, reactive power compensation, formation of VSC based Multi terminal DC is a viable solution.
- ◆ Stability analysis reveals that when the wind generators possess Low Voltage Ride Through (LVRT) capability there were no stability and low voltage problems. So it is necessary that the wind generators should have LVRT capability.

Study on power quality issues in grid connected wind farms and identification of remedial measures

The project was initiated jointly with Tamil Nadu Energy Development Agency (TEDA) and RMK Engineering College to undertake study of power quality issues in the grid connected wind farms and to recommend guidelines to alleviate the power quality issues, based on measurements at site and simulation studies.

Data collection and analysis were carried out for Peedampalli, Pethappampatty and Chinnaputhur Substations near Coimbatore with induction, Doubly Fed Induction Generator (DFIG) and synchronous generator based wind turbines respectively. The recorded events were mainly classified

as sag, swell, transients and interruptions. Flicker and harmonics were also measured. Modeling of induction and synchronous generators with steady state and dynamic analysis of various events during the study period were carried out for validating the measurement results.



Measured and simulated voltage sag at 110 kV bus bas at Chinnaputhur Substation

The project has concluded with the following remedial measurements to be adopted for improving the power quality along with suggestions.

R & D Projects in Progress :

Remedial Measures for improving Power Quality Improvement techniques

Many techniques can be utilized for eliminating voltage drop in electric power system. Few of them are:

1. Capacitor application
2. Re-Conductoring
3. Bifurcation
4. Load balancing
5. Reconfiguration
6. Fact devices

1. Capacitor application

In ac supply, if the load is of purely resistive nature then the apparent power will be equal to the active power. But in case of inductive loads, the active power is less than apparent power. It means that inductive load draws two types of power. One is called active power and other is reactive power. If reactive power is eliminated, then apparent power becomes equal to active power. The total elimination of reactive power from the system is difficult; rather it can be compensated partially by the application of capacitor. Lagging current usually causes greater voltage drop. This is primarily



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due to the fact that the reactance of the line is generally greater than resistance. Shunt capacitors are utilized to counteract this voltage drop by producing a —voltage rise across the line. The installation of capacitor also improves the power factor which in turn reduces the line losses. The application of capacitor in the distribution system provides many benefits. The Reduction in voltage drop, enhancement of overall system voltage, improvement in system voltage regulation, release of system capacity, reduction in the distribution system overloading, increase in system efficiency, reduction in line current, and power factor improvement are the most distinguishable advantages of capacitor utilization in the distribution system.

The other benefits of capacitor application include reduction of power loss in the distribution system, elimination of capital expenditure involved in system rehabilitation and reactive power compensation.

2. Re-Conductoring

Re-Conductoring of distribution feeder is another effective method of voltage improvement and voltage drop reduction. However, this method is costly as it involves the replacement of high impedance small capacity conductor by low impedance high capacity conductor. This technique is recommended only when the benefit cost ratio of re-conductoring is equal or greater than unity. Cost is reduced on the installation of new and dismantling of existing conductor. The benefits include reduction of voltage drop and saving in energy losses for a period of about five years and return value of the dismantled conductor.

3. Bifurcation

Bifurcation is applied to distribution feeder when it is highly overloaded and simple capacitor application and other techniques do not provide the desired results. The existing feeder is replaced by two or more feeders as per requirement of the locality to supply a portion of the existing area. In this method, the re- allocation of loads is carried out. Additional feeder(s) are constructed either from the same grid or from another nearby grid station depending on the economic justification and achievement of maximum benefits. This method is costly as it involves the construction of new feeder(s).

4. Load balancing

This technique is economically feasible and can be accomplished quickly. Unbalance of load on the distribution feeder occurs when single phase loads and single phase transformers are not effectively divided among the three phases. If these loads are symmetrically distributed among the three phases of the system, considerable reduction in voltage drop can be achieved. For optimal operation of the distribution feeder, load on transformers should be distributed equally on the basis of their rated power.



5. Feeder reconfiguration

Network or feeder reconfiguration is the process of altering the topological structure of distribution feeders by changing the open/close status of sectionalizing and tie switches. Reconfiguration of distribution feeder can be used as a planning as well as time control tool. Modifying the redials of distribution feeder from time to time, by changing the open/closed status of these switches can improve the path of power flow. Transfer of load from heavily loaded feeder to lightly loaded feeder improves the operating condition of overall distribution feeder. Feeder reconfiguration allows the transfer of load from heavily loaded feeder to relatively lightly loaded feeder. Such transfers are effective not only in altering the level of loads on the feeders being switched but also in improving the voltage profile along the feeders.

6. Fact devices

A shunt and series device can be connected at the suitable location in the wind farm to improve the power quality issue. The statcom is the shunt device which can inject or absorbs the reactive power from the system to maintain the system voltage at the reference value. The statcom is suitable fact device to reduce the voltage sag under the load variation and fault. The Digital Voltage Regulator (DVR) is the series voltage device in the line to control the voltage to the reference value. Transient due to switching of isolator and capacitance switching are controlled by the dynamic voltage reactor. The Unified Power Flow Controller (UPFC) is the combination of shunt and series device. The power flow at the power system is controlled either series or shunt injection or both.

Implication of poor power quality

Poor power quality in electric power distribution system has many implications. It increases in the line and equipment current leading to additional ohmic losses. The excess line and equipment currents enhance the capital investment. In most cases, this increase of current also brings significant changes in the operating temperature of distribution network and electric appliances which not only reduce the life of the equipments but also deteriorate the power quality of the system. The losses in the system increases, which in turn minimizes the efficiency of the distribution system. The numbers of outages in the system increases and severely deteriorates the quality of production in the industry. The frequent malfunction of the equipments may also reduce the production completely. The distribution engineers try utmost to eliminate the implications of the poor power quality by implementing the proper and effective system designs.

Custom power solutions

In the deregulated environment, the manufacturers are less willing to put up with products loss and defects caused by power supply problems. Small outages play significant role among the utilities and customers. Under such circumstances, the utilities are bound to mitigate the new and sterner concept of power quality .Custom power solution is implemented on the utility side of the meter and



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integrates the measures on the customer's side as well. The majority of the power conditioning devices is custom built to meet certain customer technical performance requirement and target cost. The technical performance is driven by statutory and regulatory requirements, compliance to standard, etc. In many cases, the major driver is the financial incentive arising out of the power conditioning. To ensure the optimality of the solution, it is essential to capture all the performance requirements, cost and benefit elements and arrive at an optimal solution.

Advantages of power conditioning

The advantages of the power conditioning can be classified into technical and nontechnical types. Technical merits are those that accrue due to improvements in operating efficiency and are directly related to basic laws of physics and are invariant with policies and guidelines to greater extent. The reduction of current in line and equipment minimizes the ohmic losses due to reactive power compensation and harmonic filtering is one example out of many. Non-technical benefits are those which can be obtained because of fiscal income due to regulatory norms and compliance and are largely dependent upon the existing policies and norms. Although some of the non-technical advantages have their roots in technical aspects of power conditioning, largely depend upon utility policies.

The general merits of power quality improvement include:

- ◆ Minimization of line and equipment currents, losses and thus lowered energy bill.
- ◆ Release of blocked capacity and consequent avoided cost of capital investment.
- ◆ Power factor improvement and avoided penalty for low power factor.
- ◆ Reduction in maximum demand and reduction in demand charges.
- ◆ Benefits in taxes such as accelerated depreciation benefits for installation of power conditioning or energy saving devices.
- ◆ Voltage profile improvement and consequent effective operation of electrical devices.
- ◆ Elimination of harmonic distortion and consequent reduction in copper loss, core loss and stray loss.
- ◆ Prevention of malfunction of equipment and avoided loss of production.
- ◆ Elimination of unplanned outages and reduction in loss of production and revenue.
- ◆ Reduction in failure of equipment due to reduced electrical and thermal stresses.
- ◆ Increased life and reliability of electrical devices due to lower operating temperatures and lower losses.

Fault-ride-through

As a result of the increased wind power development, focus has come to the influence of wind power on the security of the system. An important security issue is the ability of wind turbines to stay



connected, or —ride through || when the voltage dips due to a fault in the system. The main fault-ride-through concern is on the possible effect that a fault in the transmission system will have, because such a fault will influence the voltage significantly in a large area. Thus, if many wind turbines are subject to a voltage dip caused by a transmission system fault, it is important that these wind turbines are able to stay connected. Otherwise, significant generation capacity can be lost, causing power and frequency control problems in the system after the fault.

The fault-ride-through demand is also a challenge to the voltage recovery after a grid fault. Before fault-ride-through requirements became relevant to avoid loss of significant generation, the wind turbines had to disconnect to avoid large inrush currents when the voltage recovers, in order to avoid that the inrush current trips a system protection relay. Thus, the fault-ride-through requirements also raise challenges on how to recover the voltage after a dip, especially for wind turbines directly connected to the induction generators.

Suggestions for Power Quality Improvements

- ◆ All new wind generation plants must meet WECC LVRT requirements.
- ◆ All new wind plants should be Type 3 or Type 4 generators that are capable of providing dynamic reactive support to help the transmission grid to meet applicable WECC transient stability performance standards and to prevent the potential tripping due to low voltages.
- ◆ In the event that some of the new wind plants are of Type 1 or 2 with no dynamic reactive capability, the generator owner must provide sufficient reactive resources to meet the Low Voltage Ride through standards and voltage control standard. Additional studies may be required to verify that the generator has been provided appropriate additional external dynamic reactive support to meet the interconnection standards.
- ◆ Re-evaluate the optimal location and size of the dynamic reactive support.
- ◆ Analyze the best solution for improving the nose point of the Q-V analysis for critical 250 kV buses under critical contingency conditions. Potential solutions include the use of series compensation and reduction of proposed shunt compensation.

Type 1 – conventional induction generator

Type 2 – wound rotor induction generator with variable rotor resistance

Type 3 – doubly-fed induction generator

Type 4 – full converter interface

Type 1 machines operate in a very narrow speed range, and always consume reactive power during operation. The reactive power consumption is a function of active power production and grid



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conditions, and it cannot be controlled. Consequently, both the reactive power consumption of the generator and the reactive power requirements of the grid must be supplied by additional equipment - usually switched shunt capacitors.

Type 2 machines have wider speed variation and tend to exhibit slower active power fluctuations than Type 1 machines, but have similar reactive power characteristics. Under load, the machines consume reactive power equal to approximately half of the MW output.

Type 3 and **Type 4** machines use substantial power electronics to provide wider speed range and fine control of active power production. The power electronics also inherently provide the ability to produce or consume reactive power. It is largely controllable and independent of the active power production. In this regard, these machines resemble conventional synchronous generators with excitation systems and automatic voltage regulators. The details of performance are different between manufacturers. Generally, wind plants with Type 3 or Type 4 generators have the ability to provide relatively fast voltage or power factor control. The ways in which each manufacturer controls and coordinates the reactive power production and balance differs.

Electric power quality is an electric power problem manifested in voltage, current or the frequency deviations and results in failure of load side electric equipments. From electric utility point of view, the power quality is the supply of electrical power as per specified standards, whereas from the end user sight, it is the smooth functioning of electrical equipments without any disruption. In the deregulated and competitive environment, both the electric utilities as well as the customers are becoming increasingly concerned about the quality of electric power. The major reason for increased concerns is the availability of sophisticated technology that has developed extremely sensitive electrical/electronic equipment. Any sort of variation in electrical parameters greatly changes the characteristics of such delicate equipments. Widespread use of electronics in the system from home electronics to the control of massive and costly industrial processes has increased the awareness of power quality. The study of power quality and way to control it is a concern for electric utilities and electricity consumers. Equipments have become more sensitive to even minute changes in the power supply. Different indices are used by distribution engineers for the quantification of electric power quality. These indices have general properties that they are relatively easy to calculate and are calculated using standardized procedures. Majority of these indices are interpreted and applied by distribution engineers. The proliferation of micro- electronic processors in a wide range of equipment, from domestic appliances to automated industrial and hospital diagnostic systems, has increased the vulnerability of such equipment to power quality problems. These problems include a variety of electrical disturbances, which may originate in several ways and have very different effects on various kinds of sensitive loads.



Distributed Generation (DG) is said to be power generation paradigm of the new era because of its ability to resolve many customer problems, especially from power quality point of view. DG is used to provide electricity service at a high level of reliability and power quality than conventional grid power system. DG is capable of protecting sensitive loads from momentary voltage variations. It can provide uninterruptible power supply to ride through any sort of outage until primary or secondary power is restored. It is environmental friendly, promotes renewable energy resources, improves system power factor, and power quality in terms of node voltage drop and power loss reduction. A DG system provides protection from long term outages. Power quality system needs to include important design criteria that relates to system hardening. It is necessary to understand the business mission and the tolerance for outage. To eliminate the power quality and reliability disruptions, a facility may seek to minimize its energy prices by introducing DG.

The complete research report is available as pdf file on cwet.tn.nic.in/Docu/Rfp_on_26.5.2014.pdf

Study and control of weak grid connected matrix converter based DFIG system

In association with SSN College of Engineering, the Unit is working on study and control of weak grid connected matrix converter based 5 kW DFIG system. The simulation of the system has been completed. The matrix converter for the control of power flow in the DFIG has been developed. Presently, performance study of the DFIG unit interfaced with the power converter is in progress. The project is likely to be completed by 2014.



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Experimental characteristics of wind turbine blade over full $0^\circ - 360^\circ$ angle of attack

In association with the Aeronautical department of Park College of Engineering and Technology, Coimbatore, various aerofoils suiting to low and moderate wind regime have been placed inside wind tunnels and their stall hysteresis characteristics are being studied.

Intensive measurement was carried out in a blower type wind tunnel available at Park College of Engineering. The maximum test section velocity of the tunnel is 30 m/s and it has cross sectional dimensional of 610 x 610 mm. For obtaining better results profiles were taken from the root, mid and tip of the wind turbine which accounts for different thickness and chord ratio/camber ratio. All the profiles have been analyzed through angles of attack ranging from 0° to 360° . The pressure distribution was measured using pressure Scanivalve.

From the pressure distribution along the blade surface the lift and drag coefficients were calculated. The results are useful in designing the Horizontal Axis Wind Turbines blades in which the flow angle lies in the range of 0 to 90 degrees angle of attack. Also the C_l and C_d data are specifically useful to design the starting and stalling characteristics of WT which have no pitch control mechanism. The stall and post-stall behavior of the profile were investigated and the deep stall hysteresis is found in all aerofoil.



A novel hybrid energy system for supplying isolated loads with Field-Programmable Gate Array (FPGA) based Energy Management Scheme

The Unit has initiated a project in association with NIT, Tiruchirappalli aimed at design and development of a micro grid system based on hybrid renewable energy sources such as wind, solar and biomass/biogas for reliable power supply at remote locations. As part of the project, electrical generators and appropriate power electronic controllers will be designed and fabricated for this purpose. Through this, energy management using various renewable energy sources in remote locations will be demonstrated with the help of advanced digital controllers such as FPGA. The project will also involve prototype development of the complete system.

Commercial Services to the Stakeholders

Power Quality Measurement in progress Measurement of power quality

This project was initiated in association with Power Research and Development Consultants Pvt. Ltd. for measurement of power quality on a 225 kW wind turbine as per the requirements of IEC 61400-21. The measurements will mainly cover voltage fluctuations, flicker, harmonic

measurements and reactive power measurements. The measurements are expected to be completed during the windy season of April - September 2014.

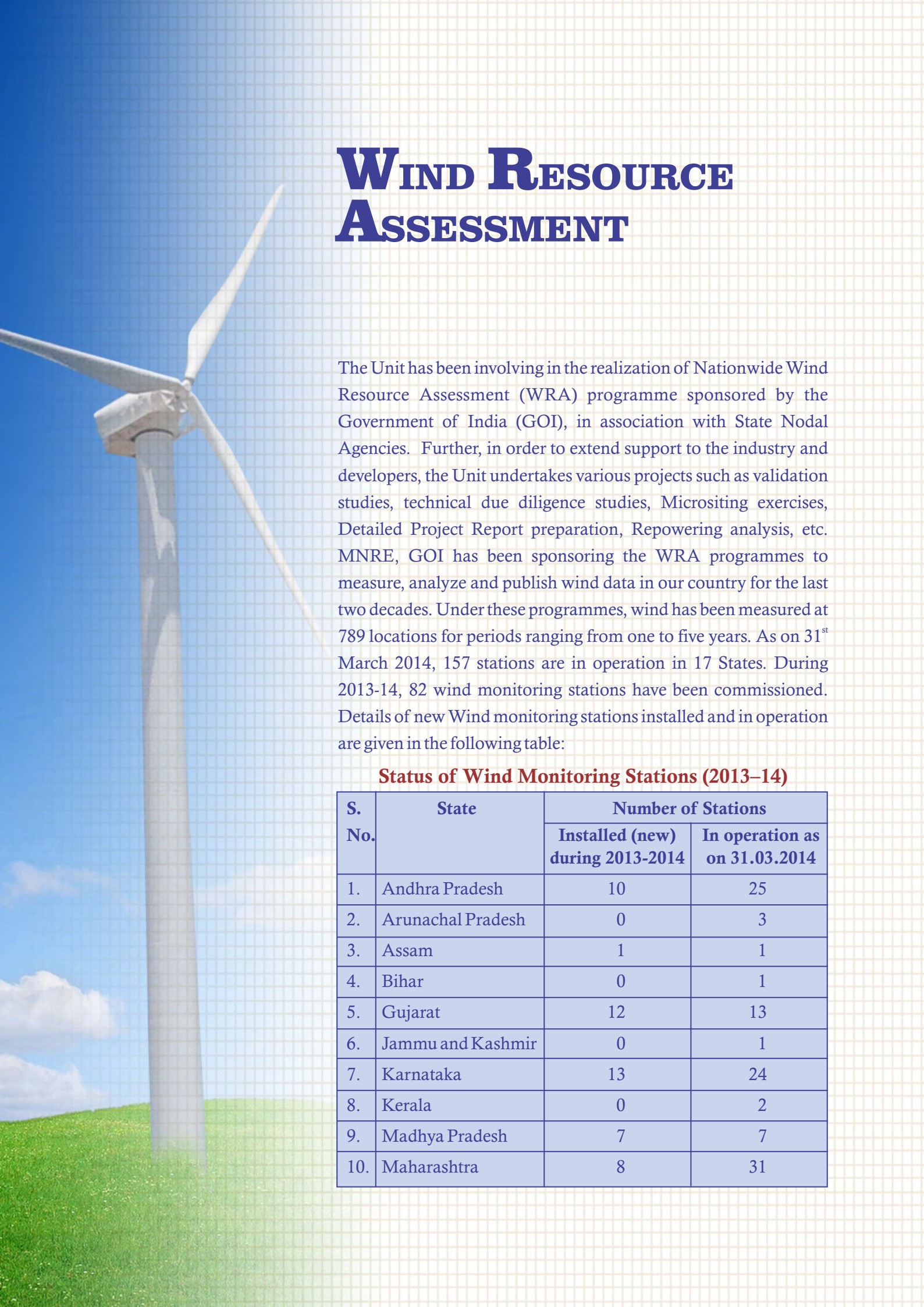
Testing of Small Wind Turbine (SWT) at Wind Turbine Research Station (WTRS)

The unit has completed four SWT testing assignments ranging from 600 W to 3.8 kW at the WTRS, Kayathar as per the requirements of IEC-61400-2 together with IEC 61400-12-1. Another seven SWTs are under test ranging from 600 W to 10 kW. The unit has also completed the review of Windistar 4500, 4.5 kW model for M/s Luminous Renewable Energy Solutions Private Limited., and is in the process of reviewing the documents for grid connected vertical axis wind turbine of 15 kW capacity from M/s VAATA Infra Limited, Chennai.



Small Wind Turbine installed for Testing at WTRS

Further, the R&D Unit in accordance with the Modified Scheme for the Programme on “Small Wind Energy and Hybrid Systems (SWES)” released by MNRE/C-WET and in pursuance to the models submitted for empanelment/provisional empanelment has released the three successive Lists of Empanelment of Small Wind Turbines during the year. The list was hosted on the C-WET's Website.



WIND RESOURCE ASSESSMENT

The Unit has been involving in the realization of Nationwide Wind Resource Assessment (WRA) programme sponsored by the Government of India (GOI), in association with State Nodal Agencies. Further, in order to extend support to the industry and developers, the Unit undertakes various projects such as validation studies, technical due diligence studies, Micrositing exercises, Detailed Project Report preparation, Repowering analysis, etc. MNRE, GOI has been sponsoring the WRA programmes to measure, analyze and publish wind data in our country for the last two decades. Under these programmes, wind has been measured at 789 locations for periods ranging from one to five years. As on 31st March 2014, 157 stations are in operation in 17 States. During 2013-14, 82 wind monitoring stations have been commissioned. Details of new Wind monitoring stations installed and in operation are given in the following table:

Status of Wind Monitoring Stations (2013–14)

S. No.	State	Number of Stations	
		Installed (new) during 2013-2014	In operation as on 31.03.2014
1.	Andhra Pradesh	10	25
2.	Arunachal Pradesh	0	3
3.	Assam	1	1
4.	Bihar	0	1
5.	Gujarat	12	13
6.	Jammu and Kashmir	0	1
7.	Karnataka	13	24
8.	Kerala	0	2
9.	Madhya Pradesh	7	7
10.	Maharashtra	8	31

S. No.	State	Number of Stations	
		Installed (new) during 2013-2014	In operation as on 31.03.2014
11.	Manipur	3	3
12.	Mizoram	0	1
13.	Odisha	0	9
14.	Rajasthan	11	12
15.	Tamil Nadu	16	18
16.	Uttar Pradesh	0	6
17.	Uttarakhand	1	1
Total		82	157

Out of 789 stations established till 31.03.2014, 237 stations have been found to have Wind Power Density (WPD) in excess of 200 W/m^2 at 50 magl. The detailed list provided at the web link http://cwet.res.in/web/html/departments_wms.html Summary of these 237 stations are presented in the following table:

WPD Distributions at 237 Stations

WPD range [W/m^2]	Number of stations
200-250	107
251-300	61
301-350	27
351-400	17
>401	25
	237

The State wise details of the wind monitoring stations commissioned during 2013-14 in the country under various WRA programmes are given in the following table:

State wise installations of wind monitoring stations established during 2013-14

S.No.	Station	District	State	Commenced On
1.	Kayathar	Tuticorin	Tamil Nadu	29/08/13
2.	Mamarathupatti	Karur		12/09/13
3.	Nallur	Erode		10/11/13
4.	Dhanuskodi	Ramanadhapuram		01/10/13
5.	Kalimandayam	Dindigul		13/12/13
6.	Karungal palayam	Dindigul		15/12/13

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S.No.	Station	District	State	Commenced On
7.	Srivilliputhur	Virudhunagar	Tamil Nadu	17/12/13
8.	Akkanayakanpatti	Tuticorin		19/12/13
9.	Melamandai	Tuticorin		21/12/13
10.	Thamaraikulam	Ramnad		24/12/13
11.	Keeranipatti	Sivagangai		26/12/13
12.	Ennore port	Chennai		20/12/13
13.	Udayalipatti	Pudukottai		16/01/14
14.	Sakarankovil	Tirunelveli		17/01/14
15.	Palayavathalakundu	Dindigul		29/01/14
16.	Subramaniyapuram	Trichy		30/01/14
17.	Motaubhada	Surendranagar	Gujarat	19/09/13
18.	Orumana	Patan		20/09/13
19.	Suigam	Banasktha		22/09/13
20.	Kuran	Kutch		23/09/13
21.	Pandharo	Kutch		25/09/13
22.	Malega	Dang		21/10/13
23.	Virathwa	Tapi		19/10/13
24.	Khavi	Bharuch		21/10/13
25.	Motibaru	Ahmedabad		22/10/13
26.	Agiyali	Bhavnagar		23/10/13
27.	Gaga	Jamnagar		25/10/13
28.	Lilwathakor	Dahod		04/12/13
29.	Gadhpati	Osmanabad	Maharashtra	24/07/13
30.	Waghira	Beed		26/07/13
31.	Hanbarwadi	Kolhapur		13/10/13
32.	Mandharwadi	Satara		14/10/13
33.	Rangewadi	Pune		16/10/13
34.	Bagachapucha	Nashik		18/10/13
35.	Vani	Nashik		19/10/13
36.	Sarola	Aurangabad		24/10/13

S.No.	Station	District	State	Commenced On
37.	Kondurpalem	Nellore	Andhra Pradesh	12/07/13
38.	Devereddypalli	Anantapur		15/07/13
39.	Gunduthanda	Kurnool		17/07/13
40.	Kompalli	Rangareddy		21/07/13
41.	Sorlagondi	Krishna		26/08/13
42.	Godugupeta	West godavari		28/08/13
43.	Sunkisala	Nalgonda		27/12/13
44.	Lingampalli	Warangal		28/12/13
45.	Chadmal	Nizamabad		30/12/13
46.	Molalagutta	Adilabad		31/12/13
47.	Bagund	Chittorgarh	Rajasthan	17/11/13
48.	Gadwada	Chittorgarh		18/11/13
49.	Ladpura	Bhilwara		19/11/13
50.	Lasadia	Rajsamand		21/11/13
51.	Sevantri	Rajsamand		24/11/13
52.	Kalyanipur	Udaipur		25/11/13
53.	Gahuwada	Dungarpur		26/11/13
54.	Dug	Jhalawar		29/11/13
55.	Gara	Banswara		29/11/13
56.	Bassi	Chitorgargh		27/12/13
57.	Bhawla	Nagaur		31/12/13
58.	Zunjawadik.n	Belgaum	Karnataka	20/10/13
59.	Mustigeri	Bagalkoti		22/10/13
60.	Taralkatti	Koppal		23/10/13
61.	Machenahalli	Gadag		24/10/13
62.	Haikal	Chitradurga		26/10/13
63.	Devalapura	Hassan		29/10/13
64.	C.bhalli	Mysore		30/10/13
65.	Hangala	Chamrajanagar		12/11/13
66.	Ramachandrapura	Hassan		13/11/13

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S.No.	Station	District	State	Commenced On
67.	Mavali	Shimoga	Karnataka	14/11/13
68.	Arikunte	Kolar		16/11/13
69.	Kanchikere	Davangere		20/11/13
70.	Nirana	Bidar		29/12/13
71.	Dend	Chhindwara	Madhya Pradesh	21/11/13
72.	Pandiwara	Seoni		23/11/13
73.	Vijayapur	Satna		25/11/13
74.	Ganesh-goshala	Shajapur		02/12/13
75.	Indra Gandhi			
	College campus	Sagar		21/12/13
76.	Gudaparihar	Neemuch		23/12/13
77.	Phuljvare	Barvani		03/01/14
78.	Doon university	Dehradun	Uttarakhand	17/12/13
79.	Tharigramvita	Dhubri	Assam	13/04/13
80.	Khuga dam	Churachandpur	Manipur	18/04/13
81.	Tingkai	Senapathi		21/04/13
82.	Paomatacentre	Senapathi		23/04/13

The wind monitoring stations are of 50m, 80m, 100 and 120m height and sensors are placed at 10m, 30m, 50m (50m height mast), 20m, 50m, 78m, 80m (80m height mast) 10m, 48m, 50m, 78m, 80m, 98m, 100m (100m height mast) 10m, 30m, 60m, 90m, 120m (120m height mast) levels. (All the heights are above ground level).

C-WET has released partial funds to the following State Nodal Agencies to install wind monitoring stations during this financial year. Details are provided in the following table:

Fund released for State Nodal Agencies to install WMS during 2013-14

Sl. No.	State	No. of stations sanctioned	Mast height (m)	Amount (Rs. in Lakhs)
WRA in North Eastern Region including Sikkim 2006 – 07				
1.	Arunachal Pradesh	3	50m	1.30
2.	Mizoram	2	50m	0.65
WRA in uncovered/new areas 2010 -11				
3.	Tamil Nadu	3	80m	7.00

Sl.	State	No. of stations	Mast height	Amount
4.	Andhra Pradesh	15	80m	40.00
5.	Karnataka	10	80m	12.10
6.	Maharashtra	20	80m	14.80
WRA studies at 80 m level in Odisha during 2011 - 12 & 2012-13				
7.	Odisha	10	80m	27.00
WRA in new/uncovered areas during 2013-14				
8.	Uttar Pradesh	3	80m	4.50
9.	Chhattisgarh	4	80m	6.00
Estimation & Validation of Wind Power Potential at 100 m level in 7 States of India				
10.	Maharashtra	8	100m	7.55
11.	Madhya Pradesh	8	100m	12.35
12.	Gujarat	12	100m	16.59
13.	Karnataka	13	100m	15.30
14.	Tamil Nadu	12	100m	12.09
15.	Andhra Pradesh	10	100m	13.35
	Total			190.58

In addition to the wind monitoring projects funded by MNRE, the unit has undertaken 108 consultancy projects during the year 2013-14 towards supporting the industry and developers. These short-term projects were to provide Micrositing services, Repowering services, preparation of Detailed Project Report and preparation of Due Diligence Reports. In addition, verification of data collection procedure adopted by private firms was undertaken for several clients under the direction from the Ministry and 11 wind monitoring stations have been commissioned under consultancy projects.

Wind Measurement at 120m level

Five 120m tall guyed wind monitoring stations are operational at Lamba (Gujarat), Akal (Rajasthan), Jagmin (Maharashtra), Jogimatti (Karnataka) and Kayathar (Tamil Nadu) to understand the wind shear effect and on the quest of acquiring long term wind data. Measurements are being carried out at 10m, 30m, 60m, 90m and 120m levels above ground. The measured data will be useful in wind resource mapping and validation of wind atlas,



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understanding inter annual variation of the wind speed in those regions and for wind farm forecasting.

Assessment of Wind Power Potential at 100m Level in India

As per the Indian Wind Atlas, installable wind power potential has been estimated as 49 GW at 50m a.g.l., and 102 GW at 80m a.g.l. with the assumption of 2% land availability (as land assessment was not part of the Wind atlas preparation, the assumption was made based on the results of micro survey studies done for a number of stations in the country) in the wind potential area and this is the most conservative reference scenario of assessment and these details are made clear in the Indian Wind Atlas. As the current technology brings up the wind turbine of higher hub heights in the range of 80-120m, it is necessary to assess the



potential at higher hub height level. At 50m level the validation has already been done with the existing few sites wind data, as 80m level measurement data was not available at the time of releasing wind atlas hence it was not validated. In order to validate the results, MNRE has sanctioned the projects to carry out wind measurement at 100m level in 75 locations in 7 States of India.

Under this, seventy five 100m tall lattice wind monitoring stations have been planned to be commissioned in the 7 windy States of the country. As on date, out of 75 Wind Monitoring Stations, 73 stations have been successfully commissioned and data acquisition is under progress. The details are tabulated in the following table:

Details of WMS commissioned at 100m level

S.No	State	Total no. of WMS sanctioned	Total no. of WMS commissioned
1	Andhra Pradesh	10	10
2	Gujarat	12	12
3	Karnataka	13	13
4	Maharashtra	8	8
5	Madhya Pradesh	8	7
6	Rajasthan	12	11
7	Tamilnadu	12	12
	Total	75	73



R&D Projects

- ◆ An 80m lattice wind monitoring station was commissioned at Ennore port to study the wind potential at Ennore port area and to understand the wind flow characteristics in the coastal region of Tamil Nadu.
- ◆ A 50m tubular wind monitoring station was commissioned at Doon University premises in connection with establishment of local wind resource assessment with actual purpose from their proposal
- ◆ A 45m lattice wind monitoring station was commissioned at C-WET, Chennai for capacity building for various officials to understand the wind flow pattern in the region.



80m mast Ennore Port



50m mast at Doon University



C-WET Mast

Special Training Programme

In order to create awareness among the State Nodal Agencies (SNA) officials regarding the importance of Wind Resource Assessment and Wind Turbine Technology, a special Training Course on "Wind Resource Assessment & Wind Energy Technology for SNAs was organized by C-WET, Chennai from 1 to 12 August 2013.

The prime objective of this training course is to transfer knowledge and needed skills to the officials from SNAs / departments for effectively implementing the wind power projects and Renewable Energy technologies in their respective States and also, to provide an invaluable platform for exchange of professional and cultural experiences amongst diverse participants from the country.

The training course was attended by 37 participants from 19 States (Tamil Nadu, Odisha, Andhra Pradesh, Kerala, Karnataka, Maharashtra, Assam, Arunachal Pradesh, Andaman & Nicobar,

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Jammu & Kashmir, Tripura, Manipur, Chhattisgarh, Gujarat, Sikkim, Rajasthan, Bihar, Ladakh and Uttarakhand) and 2 Union Territories (Goa & Pondicherry) across the country. The course was highly appreciated by the participants for its intellectual level and the way of its organization. The programme included classroom lectures, field & factory visits and practical training sessions to provide complete knowledge transfer to the participants.

The training addressed the following aspects:

- ◆ History of Wind Energy Conversion Technology and Power Generation
- ◆ Wind Energy –Onshore policies
- ◆ Indian Wind atlas Methodology and its application
- ◆ Role of C-WET in Wind Energy Development
- ◆ Wind Resource Assessment Techniques
- ◆ Siting and establishing of met towers
- ◆ Wind data Validation, processing and reporting
- ◆ Wind Farm layout design & issues
- ◆ Anatomy of Wind turbine
- ◆ Installation & Commissioning and O&M of wind Turbine
- ◆ Wind power evacuation and it's issue
- ◆ Large Wind Turbine testing and Techniques
- ◆ Small wind turbine and Hybrid system
- ◆ Certification of large Wind Turbine
- ◆ Jawaharlal Nehru National Solar Mission (JNNSM) –an overview and Solar Radiation Resource Assessment and Techniques
- ◆ Concentrated Solar Technologies for Multiple Energy Systems; Industrial Process Heating, Cooling and Distributed Power Generation
- ◆ Solar Photovoltaic Technology in Rural and Urban
- ◆ Biomass an Overview
- ◆ Biogas Technology in Rural and Urban areas



The participants were provided with Course Material which is a compilation of the write-ups of all the presentations / lectures; serves as a ready reference material for the participants to revise their studies; a tool to prepare themselves in advance during the training course.

As part of the training course, site visits have been arranged for the participants in order to understand the manufacturing process of wind turbine components, wind farm O & M and SCADA system operation. The participants were taken to ReGen Power tech Pvt. Ltd. at Tada, Andhra Pradesh, Wind Farms in and around Kayathar & Kanyakumari.





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Further, site visit has also been arranged to National Engineering College, Kovilpatti to demonstrate various solar & biomass based projects to the participants.

The training course was concluded with the Valedictory function chaired by Shri.A.Balraj, I.A.S.(Retd.) and Dr.S.Gomathinayagam, Executive Director, C-WET on 12th August 2013.

STAKE HOLDERS MEETING

A stake holders meeting was convened on 8th August 2013 at the Conference Hall of C-WET along with SNAs and C-WET officials to create more awareness on the proposed schemes for implementation of 500, 100m tall wind monitoring stations throughout the country, to be implemented by MNRE with National Clean Energy Fund (NCEF) and private / SNA participation. This would facilitate to understand the actual requirements of both stake holders and SNA to complete the WRA projects on time. The meeting was attended by 13 wind turbine manufacturer/developers and 33 SNA officials from 19 States and 2 Union Territories .

The implementation plan of the project as Scheme - 1 & 2; roles and responsibility of C-WET/SNA were briefly discussed.

Scheme – I:

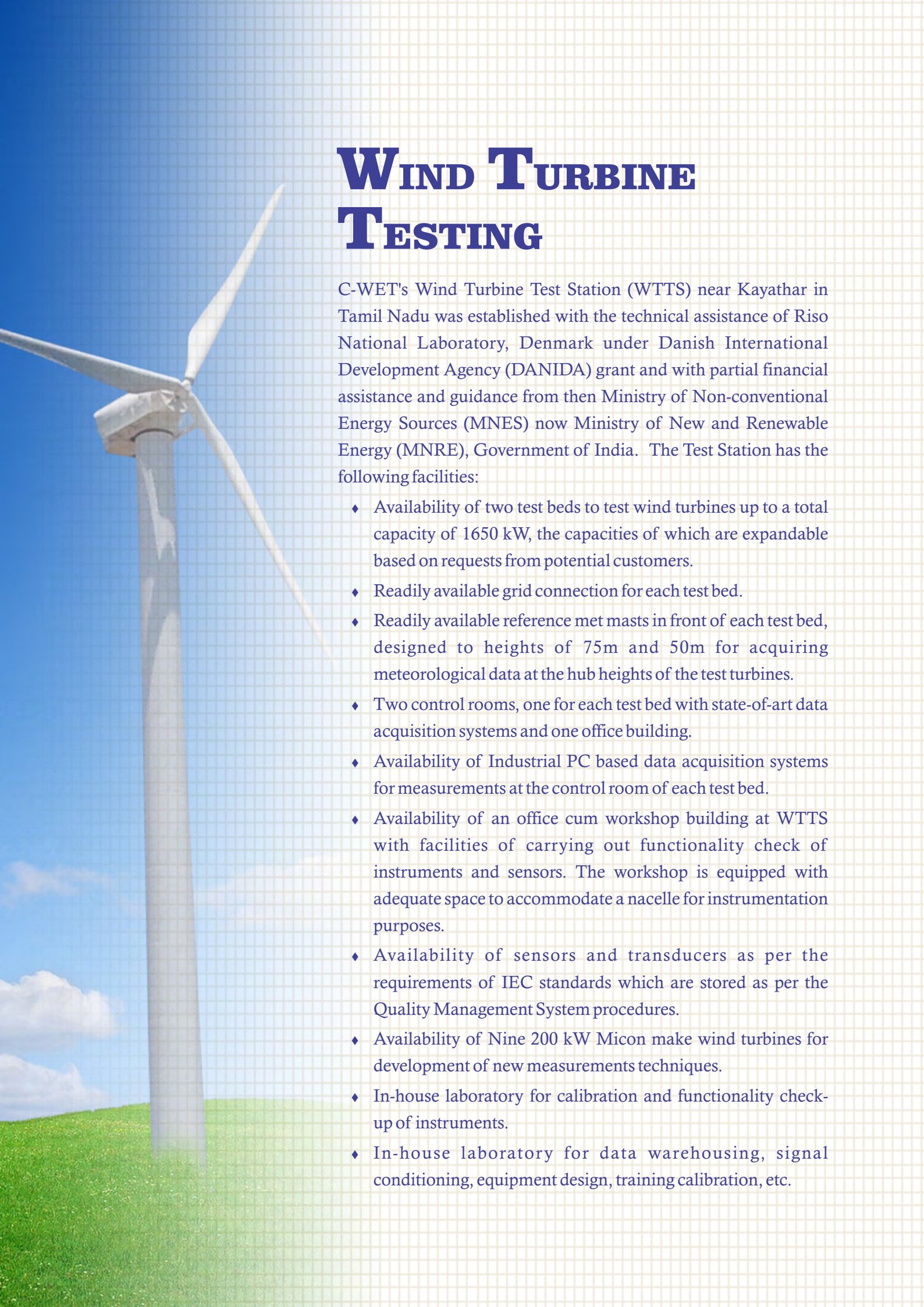
Under this, 40% of total project cost will be taken care through NCEF, the balance 30% shall be taken care by the State Government and 30% shall be borne by Private Company.

Scheme – II:

Under this, 40% of total project cost will be taken care through NCEF and remaining 60 % to be borne by Private Company. The mast size shall be 100m & above and measurement period shall be 2 years. The private developers have full rights to hold on the concerned site and market the data for first 3 years after completion and verification of the measurements. After 3 years the data needs to be handed over to Government for public use and Wind Atlas validations.

As the main objective of the proposal is to explore the wind potential of uncovered Indian States, namely, Jammu & Kashmir, Himachal Pradesh, Uttarakhand, Uttar Pradesh, Bihar, Jharkhand, Madhya Pradesh, Rajasthan, Gujarat, Punjab, Chhattisgarh, Haryana, West Bengal, Odisha, NE Regions, Kerala, Tamil Nadu, Andhra Pradesh, Karnataka, UT etc.

During the meeting, private entities, stakeholders and SNA raised various queries on the proposed schemes which MNRE is planning to implement shortly. ED, C-WET & Unit Chief (i/c), WRA clarified all the queries of SNA, Private entities and stakeholders.



WIND TURBINE TESTING

C-WET's Wind Turbine Test Station (WTTS) near Kayathar in Tamil Nadu was established with the technical assistance of Riso National Laboratory, Denmark under Danish International Development Agency (DANIDA) grant and with partial financial assistance and guidance from then Ministry of Non-conventional Energy Sources (MNES) now Ministry of New and Renewable Energy (MNRE), Government of India. The Test Station has the following facilities:

- ♦ Availability of two test beds to test wind turbines up to a total capacity of 1650 kW, the capacities of which are expandable based on requests from potential customers.
- ♦ Readily available grid connection for each test bed.
- ♦ Readily available reference met masts in front of each test bed, designed to heights of 75m and 50m for acquiring meteorological data at the hub heights of the test turbines.
- ♦ Two control rooms, one for each test bed with state-of-art data acquisition systems and one office building.
- ♦ Availability of Industrial PC based data acquisition systems for measurements at the control room of each test bed.
- ♦ Availability of an office cum workshop building at WTTS with facilities of carrying out functionality check of instruments and sensors. The workshop is equipped with adequate space to accommodate a nacelle for instrumentation purposes.
- ♦ Availability of sensors and transducers as per the requirements of IEC standards which are stored as per the Quality Management System procedures.
- ♦ Availability of Nine 200 kW Micon make wind turbines for development of new measurements techniques.
- ♦ In-house laboratory for calibration and functionality check-up of instruments.
- ♦ In-house laboratory for data warehousing, signal conditioning, equipment design, training calibration, etc.

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Detailed work / Contribution of Unit

The established test facility at Wind Turbine Test Station (WTTS), Kayathar, undertakes wind turbine testing according to International Standards. WTTS is presently equipped to undertake Type Testing of wind turbines and to conduct the testing of wind turbines as per the requests of customers / manufacturers and the following tests are normally carried out as per International standards IEC 61400-12-1, 13, 1.

- Power performance measurement
- Yaw efficiency test
- Safety and functional test
- Load measurements
- User defined measurements

The above mentioned tests are also being carried out at field sites subject to the site meeting the requirements of IEC Standards. The testing facilities are certified as per the requirements of ISO 9001:2008 and accredited as per the requirements of ISO / IEC 17025:2005.

The unit contributes to the wind energy community by knowledge transfer through National and International training programmes and by contributing technical papers to various National / International journals on a periodic basis.

Events

- ◆ An agreement was signed between C-WET and Xyron Technologies Ltd., for Type Testing of Xyron 1000 kW wind turbine on 14th May, 2013 at Richadewda Ratlam District, Madhya



Agreement signed between C-WET and M/s. Xyron Technologies Ltd for Type Testing of Xyron 1000 KW wind turbine at Richadewda Ratlam District, Madhya Pradesh



Pradesh. The instrumentation of test turbine at the site will start during the next financial year.

- ◆ An agreement was signed between C-WET and Inox Wind Limited for Type Testing of Inox 2000 kW wind turbine with rotor diameter 100 m on 14th May, 2013 at Veraval (Bhadla) village (Survey No.8), Jasdan Taluk, Rajkot District, Gujarat. The continuous measurements are on-going and being monitored.
- ◆ Special Measurement Drive Train Analysis “Witnessing” at site for Garuda 700 kW WT at Melamaruthappapuram Village, Tirunelveli district has been carried out during 24th May, 2013 to 26th May, 2013.
- ◆ An agreement was signed between C-WET and Garuda Vaayu Shakti Ltd. for Power Curve Measurements for Garuda 700 kW WT on 26th June, 2013 at Melamaruthappapuram Village, (SF. N.141/5) V.K. Pudur Taluk, Tirunelveli District and the measurements have been completed. The final Test Report has been sent to the customer.
- ◆ An agreement was signed between C-WET and Garuda Vaayu Shakti Ltd. for Type Testing for Garuda 1700 kW WT on 13th December, 2013 at Kampaneari, Pudhukudi (Village) in Tenkasi (Taluka), Tirunelveli District. The measurements are expected to start during the windy season of 2014.

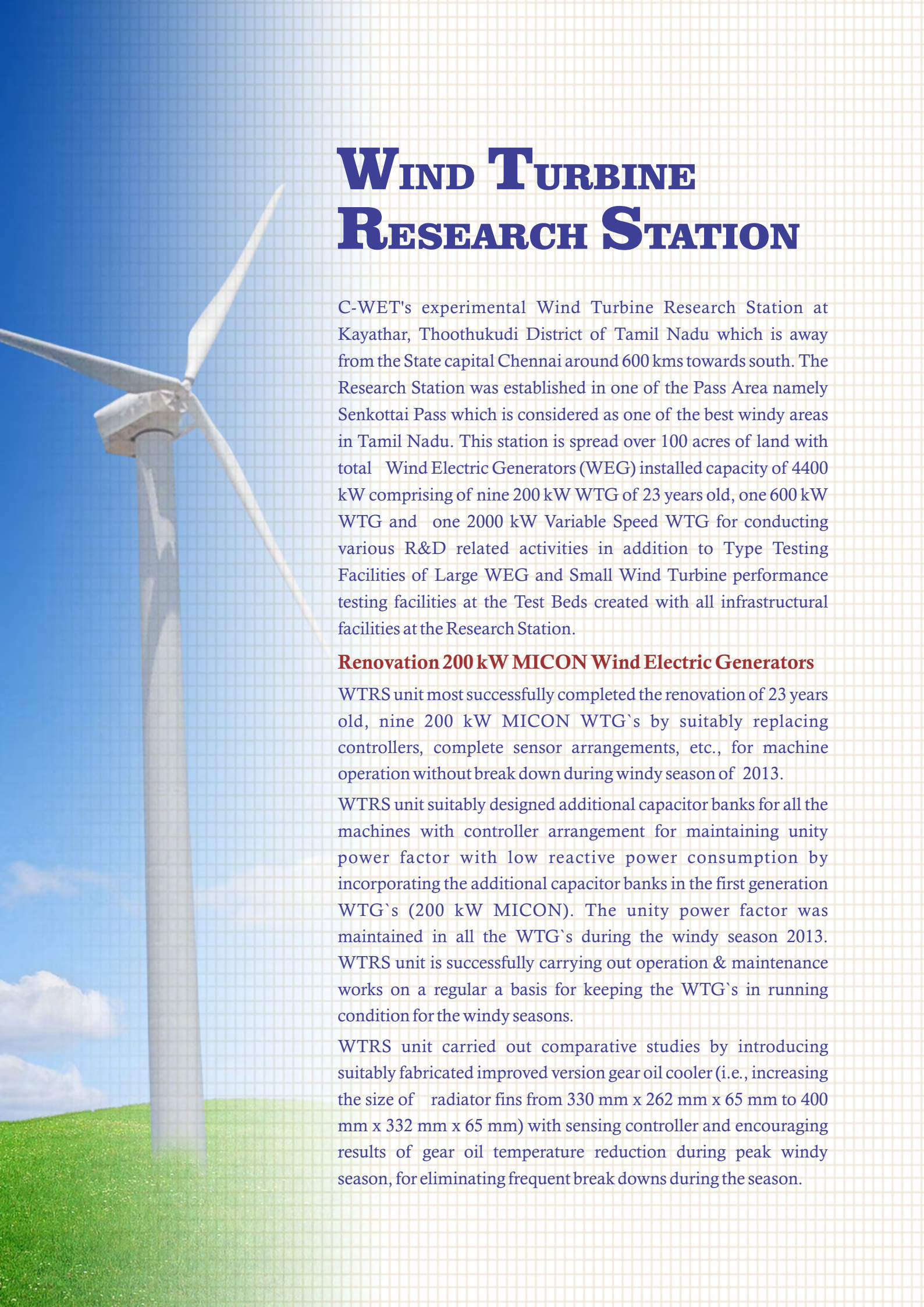
Specific Achievement

The desktop surveillance audit was completed successfully and the Unit was awarded the continuation of accreditation as per the requirements of IEC / ISO 17025:2005.

Innovation / New Facilities

An indigenous data acquisition equipment development has been completed and same is tested at the site.

Initiatives and proposals for Wind Power forecasting under an Indo-Spanish joint call for R&D projects has been prepared by the Unit.



WIND TURBINE RESEARCH STATION

C-WET's experimental Wind Turbine Research Station at Kayathar, Thoothukudi District of Tamil Nadu which is away from the State capital Chennai around 600 kms towards south. The Research Station was established in one of the Pass Area namely Senkottai Pass which is considered as one of the best windy areas in Tamil Nadu. This station is spread over 100 acres of land with total Wind Electric Generators (WEG) installed capacity of 4400 kW comprising of nine 200 kW WTG of 23 years old, one 600 kW WTG and one 2000 kW Variable Speed WTG for conducting various R&D related activities in addition to Type Testing Facilities of Large WEG and Small Wind Turbine performance testing facilities at the Test Beds created with all infrastructural facilities at the Research Station.

Renovation 200 kW MICON Wind Electric Generators

WTRS unit most successfully completed the renovation of 23 years old, nine 200 kW MICON WTG's by suitably replacing controllers, complete sensor arrangements, etc., for machine operation without break down during windy season of 2013.

WTRS unit suitably designed additional capacitor banks for all the machines with controller arrangement for maintaining unity power factor with low reactive power consumption by incorporating the additional capacitor banks in the first generation WTG's (200 kW MICON). The unity power factor was maintained in all the WTG's during the windy season 2013. WTRS unit is successfully carrying out operation & maintenance works on a regular a basis for keeping the WTG's in running condition for the windy seasons.

WTRS unit carried out comparative studies by introducing suitably fabricated improved version gear oil cooler (i.e., increasing the size of radiator fins from 330 mm x 262 mm x 65 mm to 400 mm x 332 mm x 65 mm) with sensing controller and encouraging results of gear oil temperature reduction during peak windy season, for eliminating frequent break downs during the season.



The movement of technical staff and materials required for O&M/Testing/R&D related activities are being successfully facilitated within the WTRS wind farm by the Solar Powered Battery Operated Vehicle maintained at site on a regular basis, round the clock without any fuel cost.

Industrial Visit to R&D facilities at WTRS, Kayathar

Over view of Testing/R&D facilities at WTRS/WTTS, Kayathar and field exposure training were imparted to the students on safety measures on WTG's, O&M/met masts measurements/ demonstration on small aero-generators.

- ◆ 28 Students and 2 staff from Amirtha School of Engineering , Coimbatore on 28th March 2013.
- ◆ 8 Students and 2 staff of M.Tech (Renewable Energy) from Rajasthan Technical University, Kota on 9th December 2013.
- ◆ 20 Students and 3 faculty of M.Tech (Energy), from Anna University, Tirunelveli on 7th February 2014.
- ◆ 40 Under Graduate Students and 15 PG Students with 3 staff from Arunai College of Engineering, Tiruvannamalai Tamil Nadu on 21st February 2014.

Special Visit to R&D facilities, Kayathar

- ◆ 22 Delegates and 4 Co-ordinating staff of 10th International Training Course on “Wind Turbine Technology and Applications” on 5th April 2014.
- ◆ 21 Delegates and 3 Coordinating staff from Swedish International Development Agency (SIDA) on 4th November 2013.
- ◆ 23 Delegates and 4 Coordinating staff of 11th International Training Course on “Wind Turbine Technology and Applications” on 21st September 2013.
- ◆ Dy. C&AG New Delhi along with AG officials of Tamil Nadu and Kerala State and Director (Wind), MNRE, New Delhi on 6th March 2014.
- ◆ Secretary /MNRE New Delhi visited WTRS, R&D facilities to dedicate the 120m Guyed Lattice Met Tower to the Nation on 24th December 2013.

STANDARDS & CERTIFICATION

Standards & Certification (S&C) unit is involved in Standards and type certification of Wind Turbines.

Wind Energy Sector is continuously growing in India with the introduction of more new wind turbine models and more installed capacity. Type Certification of wind turbines plays an active role to facilitate the orderly growth of wind energy sector. TAPS-2000 (amended), the Indian Certification Scheme for wind turbines has been approved and issued by MNRE. The Scheme has been prepared in line with the requirements of International standards viz., IEC standards while taking into account of Indian external conditions. The unit is implementing TAPS-2000 (amended) for certification of wind turbines.

The Unit has completed three projects on renewal of certificates of wind turbine models during the year.

Certification - Renewals Completed (2013-14)

SI No.	Manufacturer's Name	Wind Turbine Model / Capacity	Validity
1.	M/s RRB Energy Limited	V 39 – 500 kW with 47m rotor diameter / 500 kW	03.04.2014
2.	M/s RRB Energy Limited	Pawan Shakthi- 600 kW / 600 kW	04.07.2014
3.	M/s Southern Wind Farms Limited	GWL 225 / 225 kW	05.01.2015

Standards

The Unit plays an active role in preparation of Indian standards on wind turbines. Bureau of Indian Standards (BIS) has formulated a separate committee viz., Wind Turbines Sectional Committee (ET 42) for the preparation of Indian standards on wind turbines, under the Chairmanship of Executive Director, C-WET. S&C Unit



provide the technical support to ET 42 committee in all the standards related works.

Based on the contributions, three draft Indian Standards have already been accepted by ET42 committee of BIS, for printing. C-WET has formulated a Working Group on standards consisting of experts from various stake holders to assist C-WET in the standards related works. The following draft Indian Standard has been finalized, after consultations in Working Group and BIS ET 42 committee, during the year.

ETD 42(6421)	Wind turbines Part 13: Measurement of Mechanical Loads)
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S&C unit reviews draft International Electrotechnical Commission (IEC) standards periodically forwarded by BIS and provides technical support to BIS on the voting draft IEC standards at IEC TC 88 Committee. ED, C-WET & Unit Chief, S&C participated in the discussions on the preparation of Standards during the Seventeenth Electrotechnical Division Council (ETDC) meeting held at BIS, New Delhi.

Revised List of Models and Manufacturers of Wind Turbines (RLMM)

MNRE has been issuing the guidelines for Wind Power Projects to streamline the development and facilitate healthy and orderly growth of the Wind Power Sector in the Country. Based on the directives from MNRE, list of models and manufacturers is being issued by S&C Unit, C-WET, periodically.

The type certification involves multidisciplinary activities and requires the knowledge to understand and interpret the information on type certification scheme and other technical information provided in the type certificate. Hence, S&C Unit provides the technical support to the RLMM committee constituted by MNRE, in the verification of the documentation provided by various wind turbine models of manufacturers and their manufacturing facilities to finalize the list.

Three RLMM lists have been issued by S&C Unit during the year. Twelve new wind turbine models have been added in the issued RLMM lists.

Prototype Wind Turbine Models

MNRE guidelines dated 22.05.2012 & addendum dated 20.09.2012 for installation of prototype wind turbine models in India are being implemented by S&C Unit. It facilitates the installation of Prototype wind turbine models in India to carry out the Type Testing for obtaining Type Certificate and to carry out the developmental works. The guideline document stipulates various requirements to be complied for obtaining the recommendation letter. C-WET has formulated a committee to take the suitable decision on issuing the recommendation letters. S&C Unit provides the technical support to the committee in the verification of the documentation on the prototype wind turbine



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models provided by various wind turbine manufacturers. Recommendation letters are being issued by C-WET in connection with allowing the installation of a maximum number of 5 wind turbine(s) of a specific prototype wind turbine model in India and synchronize with the Indian grid system. During the year, S&C Unit has issued the recommendation letters for grid synchronization for five prototype wind turbine models.

Quality Management System

Wind Turbine certification services of C-WET are certified as per the requirements of ISO 9001:2008 by Det Norske Veritas. The S&C Unit has successfully undergone the re-certification audit conducted by Det Norske Veritas as per ISO 9001:2008 and DNV issued ISO 9001:2008 certificate with continued validity. The continual improvement and maintaining the Quality Management System are ongoing.



Issuing renewed Certificate
to M/s. RRB Energy Limited



Issuing renewed Certificate to
M/s. Southern wind Farms Limited



Manufacturing facility visit by RLMM Committee members



INFORMATION, TRAINING & COMMERCIAL SERVICES

The Unit is providing excellent facilities for learning, training and also reaching out to the public as well as industries to promote wind energy in the country. The following are the activities of the Unit during 2013-14.

Training Programmes

Apart from collation, processing, preserving and dissemination of wind related information, the prime activities of this Unit are organizing training courses for National & International participants.

The Unit has trained 903 National and 258 International professionals through its 15 National and 11 International training programmes, since 2004.

During the year 2013-14, 4 training courses - 2 National and 2 International have been conducted successfully, with the lectures of the courses delivered by eminent scientists, engineers and other wind energy professionals with years of experience drawn from C-WET, wind turbine industries and academic institutions. As part of every training course, Course Material (compilation of write-ups of all the presentations/lecturers) is provided, specially prepared for the benefit of the participants.

National Training Courses

National training courses are of 3 days duration designed to orient the participants towards Wind Energy Technology. The Unit had organized its 14th and 15th National training courses on “Wind Energy Technology” during June and November 2013, respectively.

78 participants from diverse background across the country participated in the training and there have been many suggestions and requests demanding frequent and special training courses.

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14th National Training Course



The 14th National training course on “Wind Energy Technology” was organized during 26th–28th June 2013 with 44 participants from various sectors such as wind turbine manufacturers, developers, investors, consultants and academicians from 11 States of the country. The training course was inaugurated by

Prof. Dr. A. B. Mandal inaugurating the course

Prof. Dr. A. B. Mandal, Director, Central Leather Research Institute, Chennai. Mr. S. Subba Rao, Chief Scientist & Head of Information Technology Division, Central Leather Research Institute, Chennai delivered the valedictory speech and distributed the certificates to the course participants.



Mr. S. Subba Rao distributing the Certificate



Dr. A. Amudeswari releasing the Course Material

15th National Training Course

The 15th National Training Course on “Wind Energy Technology” was successfully organized during 27th – 29th November 2013 to address all aspects of Wind Power in a focused manner and was attended by 33 participants from 18 States across the country. The training course was inaugurated

by, Dr. A. Amudeswari, Chairperson - Project Management Cluster – PME, Central Leather Research Institute, Chennai. Dr. P. Chellapandi, Group Director – Reactor Design, Indira Gandhi Centre for Atomic Research, Kalpakkam was the Chief Guest of the Valedictory Function and distributed the Course Certificates after his valedictory address.



Dr. P. Chellapandi distributing the Certificate

Global Wind Day 2013

“Global Wind Day 2013” was celebrated on 15 June 2013 at C-WET. As part of the programme, a special lecture was organized at the Conference Hall, C-WET on “Success of Wind Energy in Tamil Nadu and its Sustainability” delivered by Shri. Rajesh Lakhoni IAS, Principal Secretary, Energy Department, Tamil Nadu marked the year's Global Wind Day. All C-WET staff and some of the Tamil Nadu Electricity Board officials participated in the event. The issues related to the Wind Energy and Tamil Nadu were highlighted in his special lecture.

The Chief Guest, Shri. Rajesh Lakhoni IAS was taken to C-WET campus tour, where the C-WET activities and services were explained.



Shri. Rajesh Lakhoni delivering special lecture

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C-WET Foundation Day Celebration

C-WET's "Foundation Day", (16th Birthday and Second Year Foundation Day Celebration) was celebrated on 21st March 2014 successfully. Shri Debashish Majumdar, former Chairman & Managing Director, Indian Renewable Energy Development Agency Limited and esteemed member of Governing Council of C-WET was the Chief Guest and he delivered the Foundation Day Lecture.



Debashish Majumdar addressing C-WET Staff

C-WET's Newsletter – PAVAN

ITCS Unit has been regularly publishing the C-WET's bilingual (Hindi & English) Newsletter "PAVAN" every three months, which carries information about C-WET activities and services, wind energy news, technical articles and information on wind energy related events, and is very much useful for the wind industry. During this period, ITCS Unit had published four issues of PAVAN from 37th to 40th issue. The publication has received good feedback over the years. PAVAN aims to keep industry professionals, students and researchers updated about the progress in wind energy sector and C-WET activities & services. During this period, the number of pages increased from 8 to 16 and the number of printed copies from 250 to 500. The following technical articles have been published in the 4 issues i.e., 37th to 40th : ■ 37 -





Power System Studies for Renewable Integration by Dr. K. Balaraman, CGM, PRDC Ltd. ■ 38 - Design Aspects of Wind Turbine by Shri. Kumaravel, GM, ReGen Powertech ■ 39 - Wind Solar PV Hybrid by Shri. J.C. David Solomon, Scientist, C-WET ■ 40 - Solar Cooling Techniques by Shri. Prasun Kumar Das, Scientist, C-WET.

Prof. Anna Mani Information Centre

ITCS Unit has established and is managing the state-of-art C-WET Library named after renowned meteorologist "Prof. Anna Mani" Information Centre, with about 2000 books on renewable energy in general and wind energy in particular with allied subjects. Prof. Anna Mani Information Centre plays a vital role in Wind Research and Development by way of providing necessary assistance in terms of facilitating important information resources in both printed and e- document form related to Wind Energy and its core subjects. It identifies, evaluates, procures, processes and then makes learning resources available to the Scientists, Technical and Non-Technical Staff for their learning and research assignments.

The information centre provides effective information support towards accomplishing different activities of C-WET. The centre is being strengthened regularly by adding more books, periodicals (Indian & foreign journals/magazines), standards, reports, etc. The collection covers the areas such as wind energy, renewable energy, sustainable energy and related subjects like electrical, electronics, mechanical, environmental sciences and computer disciplines.

For easy and quick reference, the centre has been automated by using library automation software and made available Online Public Access Catalog. The centre has subscription to membership with leading libraries like IIT Madras, Anna University and American Library for reference purposes. Apart from C-WET staff, the library is widely used by many industry professionals, students and research scholars for their project and research works.



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During the year Information Centre added 100 new books and renewed subscription to 50 periodicals. The centre compiles news and latest developments related to wind energy every month from all information sources and makes it available for its users.

C-WET – Indian Wind Turbine Manufacturers Association (IWTMA) Event

C-WET and IWTMA have been jointly organizing a one day knowledge forum and this year a seminar on “Wind Measurement, Testing & Certification with association of UL DEWI ” was held on 19th July 2013 at C-WET Conference Hall. More than 50 professionals from different manufacturing companies and C-WET staff participated actively.



One Day Seminar on Wind Measurements, Testing and Certification By UL DEWI

Participation in Exhibitions

ITCS Unit had established and managed, C-WET stalls during exhibitions and trade fairs and demonstrated the activities and services of C-WET along with environmental benefits of harvesting wind energy. C-WET representatives took part in the following events and interacted with thousands of wind energy professionals, researchers, students and general public:

C-WET participated in the following exhibitions during 2013-14

2013 – 14				
Sl.No.	Name of Exhibition	Venue	During	Organized by
1	RENERGY 2013, an International Renewable Energy Conference and Expo	Chennai Trade Centre Chennai	9 th - 11 th May 2013	Tamil Nadu Energy Development Agency (TEDA)
2	"Energy Expo" on "Energy at Strategy: Augmenting Non-Conventional Energy Capacity	St. John's Vestry School, Trichy	8 th - 9 th November 2013	The Southern India Chamber of Commerce and Industry



3	8 th Asia - Pacific Conference and Expo on "Wind Engineering"	Hotel Green Park, Chennai	11 th - 14 th December 2013	Structural Engineering Research Centre
4	"28 th Indian Engineering Congress"	Hotel Leela Palace, Chennai	20 th - 22 nd December 2013	The Institution of Engineers (India)
5	101 st Indian Science Congress "India Vision 2020"	University of Jammu, Jammu	3 rd - 7 th February 2014	Indian Science Congress Association



Glimpses - C-WET Stall during Exhibitions

Visitors to the Centre

To motivate the students towards awareness and research on wind energy, achieving the indigenization and also to explain about the activities and services of C-WET, the following visits were coordinated by ITCS Unit with a presentation on wind energy and its status along with C-WET's activities & services. The campus renewable energy facilities were also explained/showcased in detail.

1234 students from 23 educational institutions and 43 professionals visited C-WET campus during the year were coordinated.



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School Students Visit

Sl.No.	Name of the School	No.of Students	Date of Visit
01.	The SCHRAM Academy	71	21.02.2014
02.	The SCHRAM Academy	71	19.02.2014
03.	Sri Shankara Senior Secondary School	75	11.02.2014
04.	St. Johns Public School	70	18.02.2014
05.	RMK Residential Senior Secondary School	98	15.06.2013
06.	RMK Residential Senior Secondary School	86	13.06.2013

College Students Visit

Sl. No.	Name of the Institutions / Organization / College	Department	No. of Students	Date of Visit
1.	Murugappa Polytechnic College	EE	73	04.03.2014
2.	Sathyabama University	IT	60	05.11.2013
3.	Sathyabama University	IT	69	25.10.2013
4.	GKM Engineering College	EEE	62	08.10.2013
5.	IRT Polytechnic	EEE	60	27.08.2013
6.	Sri Sai Ram Engineering College	EEE	85	26.08.2013
7.	Easwari Engineering College	EEE	51	23.08.2013
8.	VIT University	EEE	12	19.08.2013
9.	Hindustan University	EEE	64	14.08.2013
10.	Prathyusha Institute of Technology & Management	EEE	64	29.07.2013
11.	S. A. Engineering College	ECE	64	23.07.2013
12.	Panimalar Institute of Technology	Mech.	76	09.07.2013
13.	Panimalar Institute of Technology	CSE	81	03.07.2013
14.	Aadhiparasakthi College of Engineering	Mech.	20	13.05.2013
15.	VIT University	PE	52	23.04.2013
16.	SKR Engineering College	EEE	14	17.04.2013
17.	SRM university	Mech.	50	17.04.2013



Special Visits

Sl.No.	Participants from	No.of Visitors	Date of Visit
1.	Central Institute of Rural Electrification	14	08-11-2013
2.	National Institute of Technical Teachers Training Research (NITTTR)	15	25-02-2014
3.	LIFE Academy	19	28-02-2014

- ♦ Dr. Partha P Sarkar of Iowa State University, USA visited C-WET during 3rd to 6th December 2013 and had interactions with C-WET scientists on various technical and collaboration possibilities. He has also shared his knowledge and research facilities available in his research laboratory with C-WET staff and also delivered a series of lectures for the benefit of C-WET scientific community on “Overview of Research in Wind Engineering and Wind Energy” and “Experimental Techniques as applied to Aero-Elasticity”.



Dr. Partha P Sarkar discussing with C-WET staff

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- ◆ Dr. Sathish Balram Agnihotri, Chairman GC & Secretary, MNRE visited C-WET on 23rd December 2013 and delivered an inspiring address to all C-WET Staff members. The Executive Director explained all the activities and services of C-WET apart from showcasing the campus facilities. Shri Alok Srivastava, Joint Secretary, MNRE, Shri Sudeep Jain, Chairman and Managing Director, Tamil Nadu Energy Development Agency and Shri Dilip Nigam, Director, MNRE also accompanied Secretary during his visit to C-WET.





ENGINEERING SERVICES DIVISION

In the modern resource assessment, Wind and Solar sectors require sophisticated instrumentation and data acquisition systems interfaced with network servers using GPRS, which need to be maintained on 24x7 basis to facilitate resource data collection, storage, retrieval, analysis and processing.

C-WETs infrastructure needs multi-disciplinary engineering services starting with Civil, Electrical, Information Technology including cyber security, planning, maintenance and management. To cater to the above services, a new Engineering Service Division (ESD) has been established during the year.

The 'ESD' Unit would showcase the possible renewable energy mix in the day today energy consumption at C-WET and improve and demonstrate techniques of energy conservation as well as renewable energy penetration.

Management of IT infrastructure including Intranet and Internet facilities with focused attention on cyber security along with uninterrupted power supply.

ESD unit has coordinated with Finance & Administration wing for recruitment of Project Assistants by designing online application form for submission by the candidates.

Activity on establishing video conferencing facility has been initiated. The technical evaluation of the specification for the establishment of Campus-wide surveillance system is in final stages of completion.

The wind mill water pump was renovated with maintenance works and repainting works to enable the wind mill water pump work efficiently.

Installation of UASBAR 50 KLD bio-gas plant work has been completed and is producing bio gas which is now used in our C-WET canteen.



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A new EPABX system has been established by replacing the old one.

A proposal was made to convert the existing off Grid 15 kW SPV power plant to grid tied system.



Bio-Gas Plant Inauguration by Dr. S. Gomathinayagam, ED, C-WET



UASBR 50 KLD BIO GAS PLANT



स्टेशन विवरण / Station Details

स्टेशन का नाम / Station Name	सी-वेट चेन्नई C-WET Chennai	अक्षांस / Latitude	12°57'21.79" N
ज़िला / District	चेन्नई Chennai	देशांतर / Longitude	80°12'59.75" E
राज्य / State	तमिलनाडु Tamil Nadu	उत्कर्ष / Elevation	1 m amsl*

संस्थापन की तिथि Commissioning Date : 14.02.2014
Plant Installed by GRACE LINE BIO ENERGY Tuticorin, Tamilnadu.



Kitchen Waste & Waste Water Treatment 50 KLD Biogas plant
(UASBR- Upflow Anaerobic Sludge Blanket Reactor)

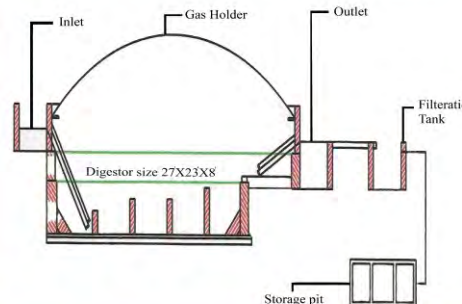
Biogas is a mixture of Methane (CH₄) and Carbon-di-oxide (CO₂) in the ratio of 60% and 40% produced anaerobic fermentation of biodegradable materials, such as manure, sewage, municipal waste, green waste, plant material and crops, in the absence of oxygen, by anaerobic bacteria with a very small carbon footprint.

At C-WET, a 50 KLD Biogas Plant installed to treat 50 to 75 kgs of kitchen waste and 50,000 litres of waste water to reduce BOD to 50 and COD 100 to 150 ppm. The total cost of the project is Rs. 5,00 lakhs and when in full operation saves about 10 LPG Cylinders a month. The biogas is a gas which can be used for electricity generation by replacing diesel up to 80% in existing generation.

The Biogas plant consists of

1. INLET- For feeding organic waste.
2. DIGESTOR- Storing the organic waste for 30 days for proper fermentation.
3. OUTLET- For removing the fermented waste.
4. GAS HOLDER- For storing the gas.

साइट विवरण / SITE DETAIL

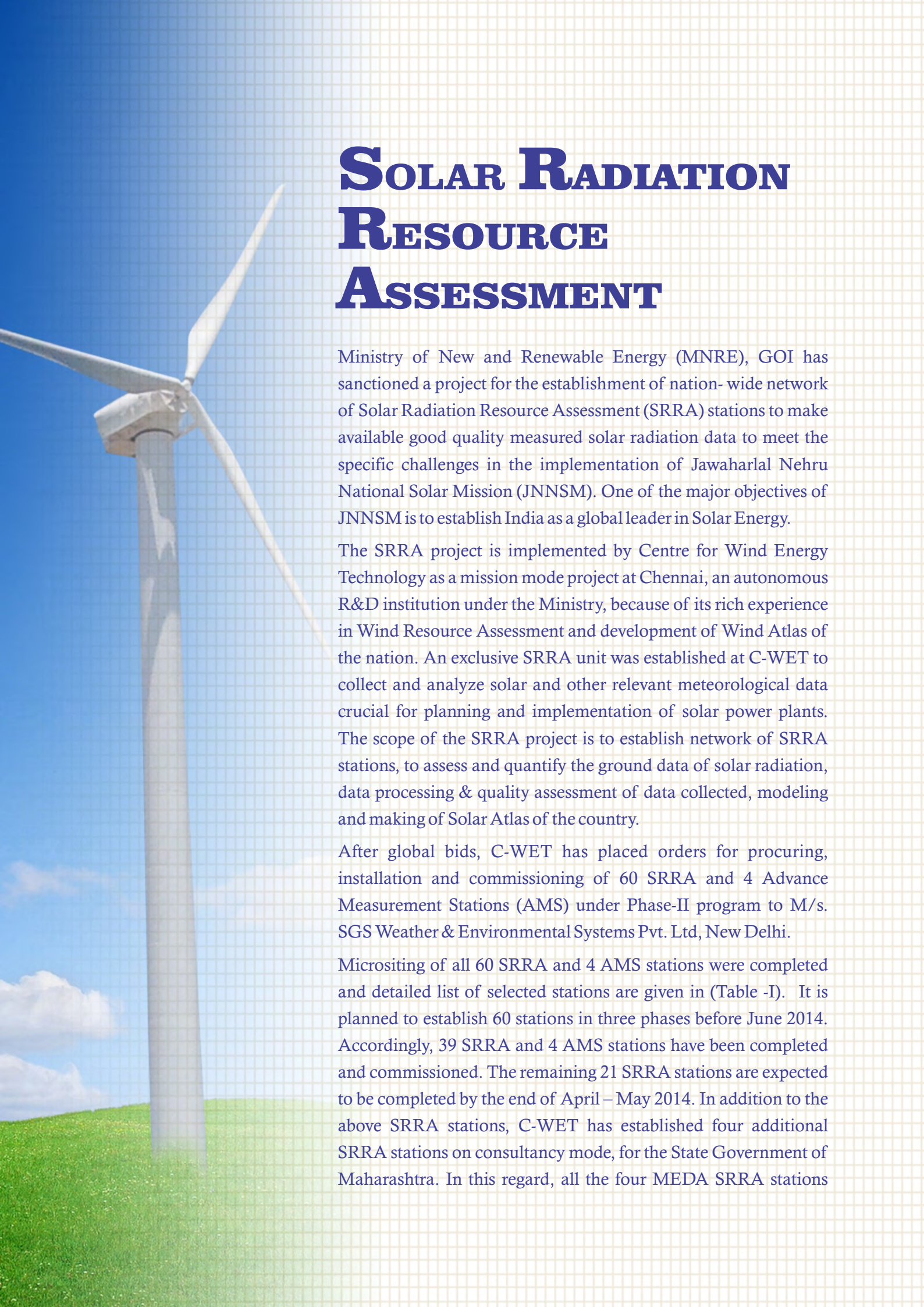


द्वारा कार्यान्वित / Implemented By

पवन ऊर्जा प्रौद्योगिकी केन्द्र / Centre for Wind Energy Technology

नवीन और नवीकरणीय ऊर्जा मंत्रालय, अधीन स्वायत्त अनुसंधान एवं विकास संस्था / An Autonomous Research and Development Institution under the Ministry of New and Renewable Energy

भारत सरकार / Government of India



SOLAR RADIATION RESOURCE ASSESSMENT

Ministry of New and Renewable Energy (MNRE), GOI has sanctioned a project for the establishment of nation- wide network of Solar Radiation Resource Assessment (SRRA) stations to make available good quality measured solar radiation data to meet the specific challenges in the implementation of Jawaharlal Nehru National Solar Mission (JNNSM). One of the major objectives of JNNSM is to establish India as a global leader in Solar Energy.

The SRRA project is implemented by Centre for Wind Energy Technology as a mission mode project at Chennai, an autonomous R&D institution under the Ministry, because of its rich experience in Wind Resource Assessment and development of Wind Atlas of the nation. An exclusive SRRA unit was established at C-WET to collect and analyze solar and other relevant meteorological data crucial for planning and implementation of solar power plants. The scope of the SRRA project is to establish network of SRRA stations, to assess and quantify the ground data of solar radiation, data processing & quality assessment of data collected, modeling and making of Solar Atlas of the country.

After global bids, C-WET has placed orders for procuring, installation and commissioning of 60 SRRA and 4 Advance Measurement Stations (AMS) under Phase-II program to M/s. SGS Weather & Environmental Systems Pvt. Ltd, New Delhi.

Micrositing of all 60 SRRA and 4 AMS stations were completed and detailed list of selected stations are given in (Table -I). It is planned to establish 60 stations in three phases before June 2014. Accordingly, 39 SRRA and 4 AMS stations have been completed and commissioned. The remaining 21 SRRA stations are expected to be completed by the end of April – May 2014. In addition to the above SRRA stations, C-WET has established four additional SRRA stations on consultancy mode, for the State Government of Maharashtra. In this regard, all the four MEDA SRRA stations

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were installed through Maharashtra Energy Development Agency, Pune.

The Technical Committee made suggestions to relocate some of the SRRA stations to more suitable locations, places where SRRA stations are required to ensure proper coverage regular maintenance. Accordingly, the first SRRA station was relocated from Sirohi sub station to One India (One MW) Solar Thermal Power project at Brahmakumari's, Abu Road.

To ensure the quality of solar sensors and as a part of International protocol, a Calibration Laboratory was set up on the roof top of C-WET main building. To study the effects of dust in the atmosphere on the sensors and measurements an experimental bed was setup and completed on roof top of C-WET main building to analyze the soiling factor/rate for SRRA instruments. These two facilities were inaugurated by Shri Satish Balram Agnihotri, Secretary, MNRE on 23rd December 2013.



To meet the main objective of SRRA project, the preparation of Solar Atlas of India, Global Bids were invited for satellite derived solar irradiance map and time series data. After the evaluation of the bid, C-WET will be procuring the satellite data and will soon come out with Solar Atlas within six months after obtaining long term digital data. C-WET also has taken up the following consultancy projects:

- ◆ Preparation of detailed report on solar assessment studies for establishing large scale Wind Solar Power Generation System at site in Kayathar.
- ◆ On site assessment of solar potential in abandoned Kudremukh iron ore mining project site in Mangalore for SPV installation.

**Table –I - Installation and Operation of Phase-II - 60 SRRA Stations
Status as on 31.03.2014)**

S. No.	State/UT	Place	No. of Stations	Date of Commissioning
1	Andhra Pradesh	Kadapa	3	13-01-2014
2		Warrangal		03-03-2014
3		Mahabubnagar		09-03-2014
4	Bihar	Aurangabad	3	16-10-2013
5		Muzaffurpur		21-09-2013
6		Purnea		21-09-2013
7	Gujarat	Surat	1	19-03-2014
8	Haryana	Murthal	1	25-08-2013
9	Chhattisgarh	Ambikapur	1	07-10-2013
10	Jharkhand	Deoghar	3	29-09-2013
11		Ranchi		02-12-2013
12		Jamshedpur		23-09-2013
13	Punjab	Talwandi Sabo	2	30-09-2013
14		Kapurthala		25-09-2013
15	Uttar Pradesh	Banda	5	10-10-2013
16		Gorakhpur		28-09-2013
17		Kanpur		12-10-2013
18		Moradabad		05-10-2013
19		Sultanpur		03-10-2013
20	Tamil Nadu	Thiruvallur	1	*
21	West Bengal	Murshidabad	3	15-10-2013
22		Howrah		17-10-2013
23		Jalpaiguri		22-09-2013
24	Maharashtra	Bhandara	6	30-12-2013
25		Jalgaon		07-01-2014
26		Shahada		02-01-2014
27		Nashik		26-12-2013
28		Osmanabad		31-12-2013

Centre for Wind Energy Technology

S. No.	State/UT	Place	No. of Stations	Date of Commissioning
29		Wardha		23-12-2013
30	Madhya Pradesh	Indore	4	06-12-2013
31		Jabalpur		10-01-2014
32		Khandwa		14-12-2013
33		Rewa		06-01-2014
34	Odisha	Baragarh	4	12-12-2013
35		Bhubaneshwar		30-12-2013
36		Similiguda		20-12-2013
37		Rourkela		06-01-2014
38	Himachal Pradesh	Palampur	2	21-09-2013
39		Solan		04-10-2013
40	Uttarakhand	Dehradun	2	*
41		Nainital		-
42	Jammu & Kashmir	Kargil	2	-
43		Katra		-
44	Karnataka	Mysore	1	-
45	Kerala	Alappuzha	2	-
46		Kannur		-
47	Rajasthan	Jaipur	1	*
North Eastern States				
48	Arunachal Pradesh	Itanagar	2	-
49		Passighat		-
50	Assam	Silchar	2	-
51		Tezpur		-
52	Manipur	Imphal	1	-
53	Meghalaya	Tura	1	-
54	Mizoram	Aizwal	1	-
55	Nagaland	Kohima	1	-
56	Sikkim	Gangtok	1	*
57	Tripura	Agartala	1	*

S. No.	State/UT	Place	No. of Stations	Date of Commissioning
Union Territories				
58	Chandigarh	Chandigarh	1	04-10-2013
59	Dadra & Nager Haveli	Silvasa	1	05-03-2014
60	Andaman & Nicobar Islands	Port Blair	1	-

* Installation in progress after 31st March 2014

S.No.	MEDA SRRA Stations	Advanced Measurement Stations
1	Aurangabad	Chennai, Tamil Nadu
2	Nanded	Gurgaon, Haryana
3	Pune	Gandhinagar, Gujarat
4	Thane	Kolkatta, West Bengal

Future Plans

- ♦ To setup two more Calibration Labs at NISE, New Delhi and PITAM, Thiruvallur for secondary calibration of solar radiation sensors.
- ♦ To Prepare reliable solar atlas of India by procuring high quality satellite data and ground truthing the same with ground measure data.
- ♦ To set up second line of solar radiation measuring instruments for assessing the solar energy in remote and complex terrains.
- ♦ The officers of the SRRA unit visited many colleges, universities, institutions for presentation and propagation of solar energy technologies, resource assessment and published many technical papers in National and International journals/seminars.



INVITED LECTURES DELIVERED BY C-WET STAFF IN CONFERENCES AND SEMINARS

Dr. S. Gomathinayagam, Executive Director

- ◆ Possibility of Generating Electricity using Waves/Tidal Power, Offshore & Other renewable energy sources at IIT, Chennai conducted by BHEL on 6th April 2013.
- ◆ National Workshop with US Department of Energy on “Grid Integration of Renewable Energy Sources & Energy Efficiency” at New Delhi on 8th April 2013.
- ◆ Chief Guest at National Conference on Methods Enriching Power & Energy Development (MEPED'13) at Jeppiar College, Chennai on 12th April 2013.
- ◆ Chief Guest for Faculty Development Programme “Power Electronics for Green Energy” at Jerusalem Engineering College, Chennai on 15th April 2013.
- ◆ Chief Guest & Keynote Speaker in the Industry Institute Interaction Conclave (IIIC 2013) at Sri Ramakrishna College of Engineering, Coimbatore on 30th May 2013.
- ◆ Keynote address on “Wind Power: The Way forward in India” in the 4th World Renewable Energy Technology Congress Conference & Exhibition & received the “Energy and Environment Foundation Global Excellence Award-2013 in Renewable Energy” at Delhi on 25th September 2013.
- ◆ Chief Guest & Inaugurated the 2 days National Level Seminar on “Recent Trends in Renewable Energy Conversion Technology” and delivered a lecture on “Wind Energy Systems” at SA Engineering College, Chennai on 5th September 2013.
- ◆ Guest of Honor at KCG Engineering College on 12th December 2013.
- ◆ Co-Chaired Asia Pacific Conference on Wind Engineering (APCWE-8) organized by CSIR-SERC during 11th to 13th December 2013 & delivered lecture on “Wind Power-The way Forward in India” & chaired a Session on Wind Energy Application (WEG-2).



- ◆ 15th National Convention-Power Tech India 2013 at Mumbai on 8th November 2013.
- ◆ Presentation on “Offshore Wind Power Development” at MNRE Delhi on 30th October 2013.
- ◆ Invited speaker in 4th Annual Conference on Wind Power in India – Reviving Growth: New Initiatives; Opportunities and Challenges organized by Power Line & Renewable Watch at The Imperial, New Delhi on 13th February 2014.
- ◆ “Offshore Wind Power – Program & Prospects” at the One day International Seminar on “Offshore Wind Power Potential of Gujarat” organized by Pandit Deendayal Petroleum University, Gandhinagar, Gujarat on 1st February 2014.
- ◆ Chief Guest at the Prize Distribution ceremony of Indian Science and Engineering Fair (INSEF) on 11th January 2014 at Agni College of Technology, Chennai.
- ◆ Keynote address at the International Conference on Renewable Energy Utilization (ICREU2014) at Coimbatore Institute of Technology, Coimbatore on 10th January 2014.
- ◆ “India's Wind Power Potential” at National Level Consultation on National Wind Energy Mission held on 9th January 2014 at New Delhi.
- ◆ Key Speaker at 3rd Wind IPP Summit 2014 held during 6th & 7th January 2014 at Goa.

Research & Development Unit

Rajesh Katyal, Scientist & Unit Chief

- ◆ “Role of Scientist in Natural Resources and Environment Management” at Indian Institute of Forest Management (IIFM), Bhopal during 9th – 13th December 2013.
- ◆ "Small wind energy and hybrid system" and "Offshore wind power development" during Short terms Training Programme on Recent Trends in Solar and Wind Energy organized by Maulana Azad National Institute of Technology, Bhopal on 7th February 2014.
- ◆ “Small Wind Turbine Hybrid Systems (SWTHS) for Mountainous region” delivered at Snow & Avalanche Study Establishment, DRDO, Chandigarh on 16th February 2014.
- ◆ “Small Wind Turbine and Hybrid Systems” at Gandhigram Rural University, Dindigul, organised by the university for M.Tech Renewable Energy Programme on 28th March 2014.

J.C. David Solomon, Scientist

- ◆ “Wind turbine Components” and “Design Aspects of Drive Train” at Gandhigram Rural University, Dindigul, organised by the university for M.Tech. Renewable Energy Programme on 24th March 2014.

Wind Resource Assessment Unit

K. Boopathi, Scientist & Unit Chief i/c

- ◆ “Wind Resource Assessment” at Pondicherry University faculties on 16th May 2013.
- ◆ “Recent trends in WRA and technology” at VIT, Kelambakkam, Chennai on 4th May 2013.



Centre for Wind Energy Technology

- ♦ “Wind Power Forecasting – Application of NCMRWF data” in the Workshop on Forecasting at National Centre for Medium Range Weather Forecasting (NCMRWF), Gurgaon during 17th to 19th February 2014.
- ♦ “Wind Resource Assessment and Techniques” at Gandhi Gram Rural Institute – Deemed University, Dindigul on 24th March 2014.

A.G. Rangaraj, Scientist

- ♦ “Wind Turbine Technology” for Electrical System for Wind & Solar Energy at National Institute of Technical Teachers Training and Research (NITTTR), Chennai on 27th February 2014.

J. Bastin, Scientist

- ♦ “Wind Resource Assessment” for Electrical System for Wind & Solar Energy at National Institute of Technical Teachers Training and Research (NITTTR), Chennai on 27th February 2014.
- ♦ “Validation of accuracy of WASP in vertical wind shear prediction” during Thursday Think Tank –TTT hour on 16th January 2014.

G. Arivukkodi, Assistant Engineer

- ♦ “Assessment of Noise Emission from a Wind Farm – A Pilot Study in Tamil Nadu” during Thursday Think Tank – TTT hour on 9th January 2014.

Wind Turbine Testing Unit

S.A. Mathew, Scientist & Unit Chief

- ♦ “Wind Energy Challenges and Prospects” to the officers of Southern Railway Headquarters, Southern Railway, Chennai on 5th February, 2013.
- ♦ “Testing and Certification of Wind Electric Generator” at the PGD Wind Energy Program at Amrita School of Engineering, Coimbatore on 26th February, 2013.
- ♦ “Renewable Energy Resources – Wind Energy” organized by Veltech Dr. RR & Dr. SR Technical University, Chennai on 21st March 2014.

Standards & Certification Unit

A. Senthil Kumar, Scientist & Unit Chief

- ♦ “Wind Potential in Tamil Nadu” in the workshop on “Wind Energy in TN-Challenges and Constraints faced in tapping wind potential and its impact in the State Power situation and its improvements' organized by Tamil Nadu State Planning Commission in collaboration with Panchabuta – Renewable Energy and Cleantec on 18th June 2013.

Information Training & Commercial Services Unit

P. Kanagavel, Scientist & Unit Chief i/c

- ♦ “Wind Energy: An Comprehensive Overview” in the AICTE sponsored Faculty Development Programme on "Renewable Energy" at Pondicherry Engineering College held during 15th & 16th May 2013.



- ◆ “Recent trends in conventional and renewable energy sources and technology on Wind Energy Technology and Applications” at VSVN Polytechnic College, Virudhunagar held during 21st to 23rd May 2013.
- ◆ “Wind Energy Conversion Technology and Power Generation” at Chennai Institute of Technology on 26th July 2013
- ◆ “Challenge and Research Opportunity in Renewable Energy” at Sri Sai Ram College of Engineering on 7th October 2013
- ◆ “Wind Energy Systems” at Sri Venkateshwara College of Engineering, Sriperumpudur on 19th October 2013.
- ◆ “Overview of Wind Energy Technology and its Status” at Manakula Vinayagar Institute and Technology on 15th November 2013.
- ◆ “Overview of Renewable Energy Sources” on Mailam Engineering College on 19th December 2013.
- ◆ “Energy Efficiency in Library and Library services” in the Refresher Course on Library and Information Science conducted by the Academic Staff College of the Bharadithasan University, Trichy on 5th January, 2014.
- ◆ Inaugurated and Chaired the One day National level Technical Symposium organized by the Department of Electrical & Electronics Engineering of Adhiparasakthi Engineering College, Melmaruvathur and delivered lecture on “Wind Energy Conversion Technology and Power Generation” on 12th February 2014.
- ◆ “Wind Power Technology and its Status in India” in the National Conference on Recent Advances in New and Renewable Energy (RANRE 2014) organized by Centre for New & Renewable Energy Studies (CNRES) of the Periyar University, Salem on 27th February 2014.
- ◆ "Overview of Development of Renewable Energy in India" in the Regional Phase of the International training on “Wind Power Development and Use” organized by LIFE Academy, Sweden at Hotel Raj Park, Chennai on 26th February 2014.
- ◆ “Role of C-WET in Wind Energy Development in India” in the Regional Phase of the International training on “Wind Power Development and Use” organized by LIFE Academy, Sweden at C-WET on 28th February 2014.
- ◆ Chief Guest for the National Conference on “Advances in Electrical Energy and Intelligent Control Systems” organized by Arunai Engineering College, Thiruvannamalai on 6th March 2014.
- ◆ “Wind Energy: A Comprehensive Overview, Wind Power Development in India and Role of C-WET” to the M. Tech Students at Gandhigram Rural Institute, Dindugal on 15th March 2014.

Engineering and Services Division

M. Anwar Ali, Scientist & Unit Chief

- ◆ “Wind Energy Technology” to Electrical and Electronics Department of Sathyabama University, Chennai on 26th February, 2013.

Centre for Wind Energy Technology

- ◆ “Renewable Energy Sources and Grid Integration Issues” at Shri Vishnu Engineering College, Bhimavaram, Andhra Pradesh on 27th December 2013.
- ◆ “G.R.I.” at Gandhigram on 23rd & 24th March 2014.

Solar Radiation Resources Assessment Unit

Dr. G. Giridhar, Scientist & Unit Chief

- ◆ “Moving towards Green Energy” in “Energy Conservation and Green Practices for SMEs” organized by Madras Chamber of Commerce on 3rd July 2013.

R. Sasikumar, Scientist

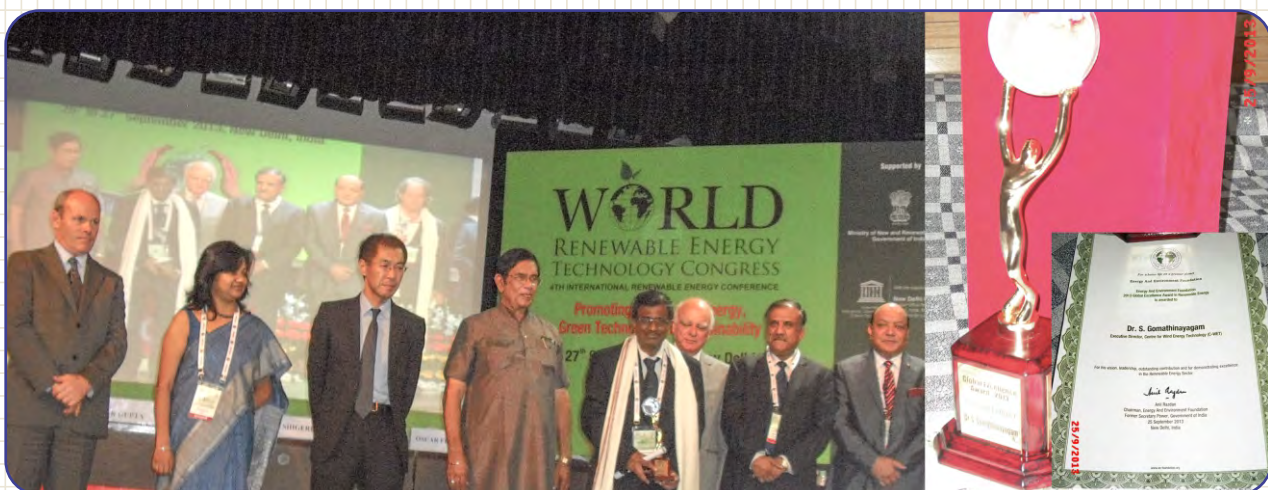
- ◆ “SRRA in the Energy Excellence” organized by CII at Trichy on 22nd February 2014.

R. Karthik, Scientist

- ◆ “SRRA techniques” in the International Workshop on Emerging Trends in Energy Systems Management at Annamalai University, Chidambaram on 15th March 2014.

AWARDS & APPRECIATION

- ◆ **Shri. S. Gomathinayagam**, ED, C-WET has been conferred by the Energy and Environment Foundation of India, the “Global Excellence Award-2013 in Renewable Energy” for his vision, leadership, outstanding contribution and for demonstrating excellence in the Renewable Energy Sector in the 4th World Renewable Energy Technology Congress Conference in September, 2013.



- ◆ **Shri. P. Kanagavel**, Scientist & Unit Chief i/c has been awarded for best design for IALA Journal published by Indian Academic Library Association (IALA), Tamil Nadu Chapter, Trichy on the occasion of Journal release in the workshop on “Library Information Skills Management” held at National College, Trichy on 21st May 2013.



14th & 15th National Training Course on “Wind Energy Technology” held during 26th to 28th June & 27th to 29th November 2013, respectively.

10th & 11th International Training Programme on “Wind Turbine Technology & Applications” held during 20th March to 12th April & 4th September to 2nd October 2013 respectively, organized for Specially for African Countries and ITEC/SCAAP Countries, respectively.

Dr. S. Gomathinayagam, Executive Director

- ◆ Wind Energy Conversion Technology and Power Generation
- ◆ Introduction and Status of Wind Energy Technology
- ◆ Wind Turbine Tower Concept

Shri. P. Kanagavel, Scientist & Unit Chief, ITCS

- ◆ Role of C-WET in Wind Energy Development
- ◆ Wind Energy Development in India
- ◆ Environmental Aspects of Wind Turbine Technology

Shri. K. Boopathi, Scientist & Unit Chief, WRA

- ◆ Wind Resource Assessment Techniques
- ◆ Wind Resource Assessment by using Remote Sensing Instruments
- ◆ Wind Turbine Components

Shri. A. Hari Bhaskaran, Scientist, WRA

- ◆ Siting Guidelines for Wind Measurements
- ◆ Monitoring Station Instrumentation and Installation

Smt. G. Arivukkodi, Assistant Engineer, WRA

Wind Data Measurements and Analysis

Shri. J.C. David Solomon, Scientist, R&D

- ◆ Drive Train Concepts
- ◆ Overview of Wind Turbine Components

Shri. A. G. Rangaraj, Scientist, WRA

Wind Electric Generators & Types

Shri. Rajesh Katyal, Scientist & Unit Chief, R&D

- ◆ Wind Turbine Foundation
- ◆ Small Wind Turbine Testing and Hybrid Systems



Centre for Wind Energy Technology

Smt. Deepa Kurup, Scientist, R&D

- ◆ Grid Integration of Wind Turbine
- ◆ Post Installation Activities - Grid Integration

Shri. A. Senthilkumar, Scientist & Unit Chief, S&C

Type Certification of wind turbine and overview of Design Requirements as per IEC 61400 - 1

Shri. S. Arulselvan, Scientist, S&C

Control and Protection System in Wind Turbine
Wind Electric Generators & Types

Shri. N. Raj Kumar, Scientist, S&C

Design aspects of Wind Turbine Gearbox

Shri. S. A. Mathew, Scientist & Unit Chief, WTT

- ◆ Wind Turbine Testing & Measurement Techniques
- ◆ Power Curve Measurements

Shri. M. Saravanan, Scientist, WTT

Instrumentation for Wind Turbine Testing

Shri. M. Anvar Ali, Scientist & Unit Chief, ESD

- ◆ Safety and Function Testing
- ◆ Wind Turbine Generators

Shri. A. Mohamed Hussain, Scientist & Unit Chief, WTRS

- ◆ Overview of Testing facilities of WTTS / WTRS
- ◆ Indian Government Policies, Schemes and Legal Frameworks

Dr. G. Giridhar, Scientist & Unit Chief, SRRA

Solar Energy and Solar Radiation Resource Assessment

Shri. J. Bastin, Scientist, WRA

Guidelines for Wind Measurements

Shri. B. Krishnan, Junior Engineer, WRA

Wind Measurement and Instrumentation

Shri. Bhukya Ram Das, Scientist, WTT

Safety and Function Testing



SEMINARS / CONFERENCES / TRAINING / EXTERNAL MEETINGS ATTENDED BY C-WET STAFFS

Dr. S. Gomathinayagam, Executive Director

- ◆ 2nd Offshore Wind Energy-Steering Committee Meet at New Delhi on 5th April 2013.
- ◆ International Renewable Energy Agency (IRENA) Meet at New Delhi on 16th April 2013.
- ◆ Research & Development meet on Small Wind Turbine at C-WET on 22nd April 2013.
- ◆ Workshop on Offshore Wind Power Development in India by ITP at New Delhi on 25th April 2013.
- ◆ Doctoral Committee Meeting at MIT, Anna University, Chennai on 26th April 2013.
- ◆ Kick start meeting for implementation of R&D project for “Setting up facility for Calibration of Solar Radiation Measuring sensors and its Analysis/modeling based on ground surface measurements” at New Delhi on 30th April 2013.
- ◆ Wind Independent Power Producers Association (WIPPA) at Chennai on 10th May 2013.
- ◆ Review Meeting on Project for Assessment of Wind Power Potential at 100 m level in 7 wind potential States at New Delhi on 6th June 2013.
- ◆ Parliamentary Standing Committee on Energy at Gangtok and Darjeeling during 7th to 11th June 2013.
- ◆ Task Force Meeting of CPRI on R&D under NPP on Distribution and Distributional Generation at Bangalore on 14th June 2013.
- ◆ NCEF IMG- Meeting on proposed 500 Nos. of wind monitoring stations at 100 m level in covered/new areas in India at New Delhi on 18th June 2013.



Centre for Wind Energy Technology

- ◆ Stake holder's workshop to gather views and identify issues with regard to the Renewable Energy Scenario in India organized by O/o the CAG at New Delhi on 24th September 2013.
- ◆ Round Table Discussion on “Managing Business Transformation: Reinventing Tech Models in Changing Business Environment” conducted by Bloomberg TV India in association with Airtel on 20th September 2013.
- ◆ Tamilnadu Energy Development Agency (TEDA) meet at Chennai on 17th September 2013.
- ◆ 2nd Meeting of the Task Force constituted to prepare the comprehensive report on wind energy in India at Planning Commission, New Delhi on 3rd September 2013.
- ◆ Doctoral Committee Meeting at MIT, Chrompet, Chennai on 21st & 29th August 2013.
- ◆ Industrial Exemption Committee Meeting at Ezhilagam, Chennai on 26th August 2013.
- ◆ Stake Holders Consultation on Offshore Meeting at MNRE, New Delhi on 14th August 2013.
- ◆ 5th Executive Committee meeting of Centre for Aerospace Research at Anna University, Chennai on 6th August 2013.
- ◆ Task Force Meeting on Comprehensive Report on Wind Energy in India conducted by Indian National Academy of Engineering, New Delhi on 25th July 2013.
- ◆ Bureau of Indian Standards meeting at New Delhi on 18th July 2013.
- ◆ Solar Radiation Resource Assessment meeting at Delhi on 9th July 2013.
- ◆ Committee Meeting on Installation of Prototype Wind Turbine Models Meeting at C-WET on 4th July 2013.
- ◆ Meeting for Procurement of 2 new Wind Turbine on 20th December 2013.
- ◆ Chaired Prototype meeting on 19th December 2013.
- ◆ Wind Resource Assessment of 500 stations meeting with NCEF on 18th December 2013.
- ◆ Offshore Wind Power Development Meeting at ONGC Mumbai on 29th November 2013.
- ◆ Standing Committee on Energy 2013-14 Examination of the subjects “Firming up of Potential capacity in NRE sector and meeting funds requirements thereof” on 27th November 2013.
- ◆ Standing Parliamentary Committee on Energy at Madurai during 9th to 12th November 2013.
- ◆ “Wind Power Development in India – Way Forward” for Life Academy Members at C-WET on 1st November 2013.
- ◆ Small Wind Turbine Empanelment meeting on 29th October 2013.
- ◆ Steering Committee Meeting of TEDA on Renergy 2014 on 25th October 2013.
- ◆ Workshop on Under Water Technologies-2013 at NIOT on 21st October 2013.
- ◆ Discussion of Project Proposal on “Demonstration of Grid Interactive Sustainable Wind Hydrogen Power System” at Electrical Research & Development Association (ERDA), Vadodara on 9th October 2013.



- ◆ Meeting with Dy. CAG, New Delhi during the visit to WTTS, Kayathar on 6th March 2014.
- ◆ Meeting regarding Procurement of land for R&D/WRA Testing purpose on 1st March 2014 at WTTS, Kayathar.
- ◆ To discuss about UNESCAP Phase-II of Renewable Energy Cooperation project and the proposed Expert Group Meeting scheduled for April/ May, 2014 at New Delhi on 28th February 2014.
- ◆ Doctoral Committee meeting at Hindustan Institute of Technology & Science (HITS) and at Anna University, Guindy during 24th & 27th January 2014.
- ◆ 1st Governing Council Meeting of National Institute of Solar Energy on 15th January 2014 at New Delhi.

Research & Development Unit

Rajesh Katyal, Scientist & Unit Chief

- ◆ Invited speaker for the National Conference on “Resource Management of Sustainable Development” (PARADIGM-2014) organized by Ethiraj College for Women, Chennai, on 8th January 2014.

Wind Resource Assessment Unit

K. Boopathi, Scientist & Unit Chief i/c

- ◆ 4th Clean Energy Ministerial and Wind Solar Technology Meeting at New Delhi on 16th April 2013.
- ◆ Ammonit software and data logger connection training at C-WET premises.
- ◆ Meeting with Rameshwaram Tasildar & VAO for Inspection of Civil Foundation Work for Installation & Commissioning of 100m tall mast at Dhanushkodi on 6th May 2013.
- ◆ Technical Evaluation Committee Meeting for Development of Wind Power programme in at Trivandrum, Kerala for M/s. ANERT on 22nd May 2013.
- ◆ SNA Meeting at MNRE, New Delhi on 6th June 2013.
- ◆ Parliamentary Committee Meeting at Gangtok from 7th to 10th June 2013.
- ◆ Prebid Meeting at M/s. JNPT, Mumbai for their proposed 7 MW Wind farm Project on 22nd July 2013.
- ◆ Training for the participants during the 11th International Training Course on “Wind Resource Assessment and Techniques” and “Wind Resource Assessment by Remote Sensing Instruments” at C-WET premises.
- ◆ Prebid Meeting at M/s. RITES, Gurgaon for their proposed 25 MW Wind farm Projects on 3rd October 2013.



Centre for Wind Energy Technology

- ◆ Review Meeting of Wind Resource Assessment Programme for the North East Region including Sikkim at Guwahati, Assam from 15th to 17th October 2013.
- ◆ Offshore Wind Energy Assessment Meeting at MNRE, New Delhi on 30th October 2013.
- ◆ Parliamentary Standing Committee Meeting at Madurai and visited 100m mast at Dhanushkodi along with MNRE officials (Advisor, Wind Energy & Director Wind Energy) from 9th to 12th November 2013.
- ◆ Technical Evaluation Committee Meeting at M/s.ANERT, Kerala on 22nd November 2013.
- ◆ “Wind Resource Assessment and implementation” of 500 nos. of 100m level WMS funded under National Clean Energy Fund (NCEF) at MNRE, New Delhi on 18th December 2013.
- ◆ Eighth Asia Pacific Conference on Wind Engineering (APCWE-VIII) held at the Green Park hotel, Chennai during 10th & 14th December 2013.
- ◆ Co-chaired one of the session of Eighth Asia-Pacific Conference on Wind Engineering on 13th December 2013.
- ◆ Imparted hands on training for ANERT officials at Palakkad on 23rd November 2013.
- ◆ Participated in the National Level consultation on National Wind Energy Mission scheduled at India Habitat Centre, New Delhi on 9th January 2014.
- ◆ First Wind Monitoring Stations (WMS) Advisory Committee Meeting at C-WET premises and finalized the draft Guidelines and the same has been sent to MNRE for further action on 18th January 2014.
- ◆ Review Meeting on offshore Wind Power Development at MNRE, New Delhi on 23rd January 2014.
- ◆ India/UK Offshore Wind Energy Workshop held at C-WET premises on 6th February 2014.
- ◆ Technical Committee Meeting for real time data transfer from NOMAD2 data logger through GPRS at C-WET premises on 11th February 2014.
- ◆ Workshop on Forecasting at National Centre for Medium Range Weather Forecasting (NCMRWF), Gurgaon during 17th to 19th February 2014.
- ◆ Meeting with Stake holders in connection with obtaining their views/comments on the draft guidelines finalized by MNRE for establishment of 500 nos. of Wind Monitoring Stations through National Clean Energy Fund (NCEF) scheme at C-WET Premises on 18th March 2014.
- ◆ Meeting for the establishment of 500 nos. of WMS through NCEF scheme at Ministry of New and Renewable Energy, New Delhi on 26th March 2014.
- ◆ Governing Council Meeting held at Ministry of New and Renewable Energy, New Delhi on 27th March 2014.



- ◆ Coordinated with M/s.Pulse Media Pvt.Ltd., New Delhi for "Temples of Modern India" Wind Energy Video documentary shoot at C-WET and WTTS/WTRS Kayathar from 24th to 27th May 2013.
- ◆ Photonic lab visit at GVP College at Visakhapatnam towards development of indigenous LIDAR on 29th January 2014.
- ◆ Visited Andaman & Nicobar Island regarding exploring possibilities for setting up Wind-Diesel hybrid system and having discussion with Assistant Commissioner, Executive Engineer for the same during 20th to 28th February 2014.
- ◆ Discussion with M/s.NEVCO Engineers in connection with Data logger on 17th February 2014.
- ◆ Kayathar visit to know the possibility of developing Wind Farm at the proposed C-WET land on 1st March 2014.
- ◆ Signed the Non Discloser Agreement and with M/s.Vortex for R & D Project.
- ◆ Wind Farm Design & Introduction to Wind farmer software training organised by M/s. DNV GL - Energy at Chennai on 25th & 26th November 2013.
- ◆ CFD Wind Modeling & Micrositing in complex sites training organized by India National CFD Training – I Edition on 8th November 2013.
- ◆ ArcGIS 10.2 training during 10th & 11th March 2014.

A. Haribhaskaran, Scientist

- ◆ SNA Meeting at MNRE, New Delhi on 6th June 2013.
- ◆ Ammonit software and data logger connection training at C-WET.
- ◆ Site selection for Assam for the establishment of WMS for M/s.NEELCO at Assam from 1st to 3rd May 2013.

Joel Franklin Asaria, Scientist

- ◆ Eighth Asia Pacific Conference on Wind Engineering (APCWE-VIII) held at the Green Park hotel, Chennai during 10th to 14th December 2013.
- ◆ International Seminar on Impact of Generation from Renewable Sources on Conventional Power Generation and Grid, organized by CEA, Ministry of Power, GIZ& STEAG Energy Services (India) Pvt.Ltd. at New Delhi on 31st January 2014.
- ◆ India/UK Offshore Wind Energy Workshop held at C-WET on 6th February 2014.
- ◆ 25th National Conference on Environmental Engineering held at CLRI, Chennai during 12th - 14th March 2014.
- ◆ CPR Environmental Education Centre, Chennai and had discussion in connection with environmental status of proposed offshore wind energy sites (Rameshwaram & Kanyakumari) on 4th March 2014.



Centre for Wind Energy Technology

- ◆ Environmental baseline data collection carried out for Feasibility study of Offshore Wind Energy for the proposed sites (Rameshwaram & Kanyakumari).
- ◆ Site selection for Palakkad district, Kerala for M/s.NHPC during 27th to 29th March 2014.

A.G. Rangaraj, Scientist

- ◆ Divisional Scientific Committee Meeting at National Aerospace Laboratory (NAL), Bangalore on 11th September 2013.
- ◆ Presented the status of documentation and Manufacturing facility of Pawan Shakthi PS-1800 kw (HH 80 m / 100 m) wind turbine model to the RLMM committee.
- ◆ Eighth Asia Pacific Conference on Wind Engineering (APCWE-VIII) held at the Green Park hotel, Chennai during 10th & 14th December 2013.
- ◆ "A Study on Influence of a Ridge on Mean Wind Speed and Turbulence Intensity" in Eighth Asia Pacific Conference on Wind Engineering (APCWE-VIII) held at the Green Park hotel, Chennai on 13th December 2013.
- ◆ First Wind Monitoring Stations (WMS) Advisory Committee Meeting at C-WET premises and finalized the draft Guidelines and the same has been sent to MNRE for further action on 18th January 2014.
- ◆ India/UK Offshore Wind Energy Workshop held at C-WET on 6th February 2014.
- ◆ Discussions with M/s.NEVCO Engineers in connection with Data logger on 17th February 2014.
- ◆ Training on “Arc GIS” at C-WET Premises during 10th & 11th March 2014.
- ◆ Meeting with Stake holders in connection with obtaining their views/comments on the draft guidelines finalized by MNRE for establishment of 500 nos. of Wind Monitoring Stations through National Clean Energy Fund (NCEF) scheme at C-WET on 18th March 2014.
- ◆ Based on the directions of ED, CWET/Chairman RLMM Committee reviewed the RLMM Application form and documentation for Pawan Shakthi PS-1800 kw (HH 80 m / 100 m) wind turbine model.
- ◆ Verification of Manufacturing facility of M/s. RRB Energy Limited in connection with RLMM.
- ◆ Kudhremukh visit along with Director, MNRE in connection with preparation of feasibility report for establishing MW class wind power project
- ◆ Wind Farm Design & Introduction to Wind farmer software training organised by M/s. DNV GL - Energy at Chennai on 25th & 26th November 2013.
- ◆ CFD Wind Modeling & Micrositing in complex sites training organized by India National CFD Training – I Edition on 8th November 2013.

J. Bastin, Scientist

- ◆ Ammonit software and data logger connection training at C-WET.



- ◆ Training on “Arc GIS” at C-WET Premises during 10th & 11th March 2014.
- ◆ India/UK Offshore Wind Energy Workshop held at C-WET on 6th February 2014.
- ◆ Ennore Port Trust visit for site selection for R & D Project.
- ◆ Imparted hands on training for ANERT officials at Palaghat on 23rd November 2013.
- ◆ Eighth Asia Pacific Conference on Wind Engineering (APCWE-VIII) held at the Green Park hotel, Chennai during 10th to 14th December 2013.
- ◆ Photonic lab visit at GVP College at Visakhapatnam towards development of indigenous LIDAR on 29th January 2014.
- ◆ Discussion with M/s. NEVCO Engineers in connection with Data logger on 17th February 2014.
- ◆ International Tropical Metrology Symposium (INTROMET 2014) at SRC University, Chennai during 21st to 24th February 2014.
- ◆ Wind Farm Design & Introduction to Wind farmer software training organized by M/s. DNV GL - Energy at Chennai on 25th & 26th November 2013.
- ◆ CFD Wind Modeling & Micrositing in complex sites training organized by India National CFD Training – I Edition on 8th November 2013.

M.C. Lavanya, Scientist

- ◆ Training on “Arc GIS” at C-WET Premises during 10th & 11th March 2014.
- ◆ India/UK Offshore Wind Energy Workshop held at C-WET on 6th February 2014.
- ◆ Discussion with M/s. NEVCO Engineers in connection with Data logger on 17th February 2014.

G. Arivukkodi, Assistant Engineer

- ◆ Ammonit software and data logger connection training at C-WET.
- ◆ “Assessment of Noise Emission from a Wind Farm – A Pilot Study in Tamil Nadu” during Thursday Think Tank – TTT hour on 9th January 2014.
- ◆ Discussion with M/s. NEVCO Engineers in connection with Data logger on 17th February 2014.

B. Krishnan, Junior Engineer

- ◆ Coordinated with M/s. Pulse Media Pvt. Ltd., New Delhi for “Temples of Modern India” Wind Energy Video documentary shot at C-WET and WTTS/WTRS Kayathar from 24th to 27th May 2013.
- ◆ Ammonit software and data logger connection training at C-WET.
- ◆ Imparted hands on training for ANERT officials at Palaghat on 23rd November 2013.
- ◆ Visited Andaman & Nicobar Island regarding exploring possibilities for setting up Wind-Diesel hybrid system and having discussion with Assistant Commissioner, Executive Engineer for the same during 20th to 28th February 2014.



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- ◆ Discussion with M/s. NEVCO Engineers in connection with Data logger on 17th February 2014.
- ◆ Site selection for Palakkad district, Kerala for M/s.NHPC during 27th to 29th March 2014.
- ◆ Wind Farm Design & Introduction to Wind farmer software training organized by M/s. DNV GL - Energy at Chennai on 25th & 26th November 2013.
- ◆ CFD Wind Modeling & Micrositing in complex sites training organized by India National CFD Training – I Edition on 8th November 2013.

T. Suresh Kumar, Junior Engineer

- ◆ Ammonit software and data logger connection training at C-WET.
- ◆ Meeting with Rameshwaram Tasildar & VAO for Inspection of Civil Foundation Work for Installation & Commissioning of 100m tall mast at Dhanushkodi on 6th May 2013.
- ◆ Technical Committee Meeting for real time data transfer from NOMAD2 data logger through GPRS at C-WET on 11th February 2014.
- ◆ Discussion with M/s. NEVCO Engineers in connection with Data logger on 17th February 2014.
- ◆ Coordinated with M/s.Pulse Media Pvt.Ltd., New Delhi for "Temples of Modern India" Wind Energy Video documentary shot at C-WET and WTTS/WTRS Kayathar from 24th to 27th May 2013.
- ◆ Provided hands on training to C-WET project Assistants in connection with Installation / commissioning of Wind monitoring station.
- ◆ Successfully cleared the examination conducted by RisoDTU, Denmark in connection with WAsP Certification.
- ◆ CFD Wind Modeling & Micrositing in complex sites training organized by India National CFD Training – I Edition on 8th November 2013.

Vinod Kumar, Technician

- ◆ Training in connection with "Ammonit software and data" at C-WET premises.
- ◆ Given hands on training for the participants during 11th International Training Course at C-WET premises.
- ◆ Discussion with M/s.NEVCO Engineers in connection with Data logger on 17th February 2014.
- ◆ Coordinated with M/s.Pulse Media Pvt.Ltd., New Delhi for "Temples of Modern India" Wind Energy Video documentary shot at C-WET and WTTS/WTRS Kayathar during 24th to 27th May 2013.
- ◆ Provided hands on training to C-WET project Assistants in connection with Installation / commissioning of Wind monitoring station.
- ◆ Training on "CFD Wind Modeling & Micrositing in complex sites" organized by India National CFD Training – I Edition on 8th November 2013.



Wind Turbine Testing

S. A. Mathew, Scientist & Unit Chief

- ♦ Workshop on the “National Level Consultation on National Wind Energy Mission” organized by Ministry of New & Renewable Energy (MNRE) at Indian Habitat Center, New Delhi on 9th January, 2014.
- ♦ Invited to chair R&D Meeting (Electrical & Electronics Engineering) for innovative research proposals at Veltech Dr. RR & Dr. SR Technical University, Chennai on 9th March 2014.
- ♦ “Overview of Research in Wind Engineering & Wind Energy” and “Experimental Techniques as applied to Aero Elasticity” presented by Dr. Partha P. Sarkar, IOWA State University, USA at C-WET on 4th December 2013.
- ♦ “Wind-Solar Mapping Capabilities, Methodologies / Approaches” presented by Dr. Pascal Storck and Dr. Matt Hendrickson, VP, & Head (Assessment) of M/s. 3-TIER, Seattle, USA at C-WET on 27th February 2014.
- ♦ Invited Panel Member of the EEE R&D Meeting (14th Cycle) to review the Research Proposal submitted by the EEE faculty members and to give valuable suggestions to improve the ideas for their proposals held at Veltech Dr. RR & Dr. SR Technical University, Chennai on 28th July 2013.
- ♦ Invited as Workshop Rapporteur on “National Consultation on Development of Offshore Wind Energy in India” held at Ministry of New and Renewable Energy, New Delhi on 14th August 2013.
- ♦ “Second National Conclave for Laboratories” on the theme “Innovative Practices in Laboratory Management” jointly organized by CII and NABL at Bangalore on 16th - 17th September 2013.
- ♦ Chaired the R&D Meeting for Electrical & Electronics Engineering for innovative research proposals at VelTech Dr. RR & Dr. SR Technical University, Chennai on 6th October 2013.
- ♦ Training programme on “Laboratory Quality System, Management & Internal Audit as per IS/ISO 17025” organised by Bureau of Indian Standards (BIS), Chennai on 18th to 21st November 2013.

M. Saravanan, Scientist

- ♦ One-day knowledge sharing seminar on “Wind Measurement, Testing and Certification” by DEWI, DEWI Offshore Certification Centre and Underwriters Laboratories (UL), GmbH in association with C-WET and IWTMA on 19th July 2013.
- ♦ “Wind-Solar Mapping Capabilities, Methodologies / Approaches” presented by Dr. Pascal Storck and Dr. Matt Hendrickson, VP, & Head (Assessment) of M/s. 3-TIER, Seattle, USA at C-WET on 27th February 2014.
- ♦ Training programme on “Laboratory Quality System, Management & Internal Audit as per IS/ISO 17025” organised by Bureau of Indian Standards (BIS), Chennai on 18th to 21st November 2013.



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- ◆ Training programme on “Inter-lab comparison, proficiency testing and evaluation of Z-Score” organised by Bureau of Indian Standards (BIS), at BIS, Chennai on 13th & 14th February 2014.

Bhukya Ramdas, Scientist

- ◆ One-day knowledge sharing seminar on “Wind Measurement, Testing and Certification” by DEWI, DEWI Offshore Certification Centre and Underwriters Laboratories (UL), GmbH in association with C-WET and IWTMA on 19th July 2013.
- ◆ “Wind-Solar Mapping Capabilities, Methodologies / Approaches” presented by Dr. Pascal Storck and Dr. Matt Hendrickson, VP, & Head (Assessment) of M/s. 3-TIER, Seattle, USA at C-WET on 27th February 2014.
- ◆ “Smart grid-technology and applications” organized by Central Power Research Institute, Bangalore on 23rd to 27th September 2013.
- ◆ “Grounding Practices” organized by Central Power Research Institute (CPRI), Bangalore on 21st & 22nd November 2013.
- ◆ “Wind Farm Design & Introduction to Windfarmer” organised by Garradhassan at T.Nagar, Chennai on 25th & 26th November 2013.
- ◆ Training programme on “Inter-lab comparison, proficiency testing and evaluation of Z-Score” organized by Bureau of Indian Standards (BIS), at BIS, Chennai on 13th & 14th February 2014.

Y. Packiyaraj, Assistant Engineer

- ◆ “Grounding Practices” organized by Central Power Research Institute (CPRI), Bangalore on 21st & 22nd November, 2013.

A.R. Hasan Ali, Assistant Engineer

- ◆ ”Measurement Uncertainty” organized by Bureau of Indian Standards (BIS) at BIS, Chennai on 10th to 12th February 2014.

S. Paramasivam, Junior Engineer

- ◆ “Wind Data Generator Software” by Mr. Karim Sasis from Meteopole Software, France at C-WET on 27th February, 2013.
- ◆ One-day knowledge sharing seminar on “Wind Measurement, Testing and Certification” by DEWI, DEWI Offshore Certification Centre and Underwriters Laboratories (UL), GmbH in association with C-WET and IWTMA on 19th July, 2013.
- ◆ “Wind-Solar Mapping Capabilities, Methodologies / Approaches” presented by Dr. Pascal Storck and Dr. Matt Hendrickson, VP, & Head (Assessment) of M/s. 3-TIER, Seattle, USA at C-WET on 27th February, 2014.
- ◆ Training programme on “Surface preparation of maximum loading points on wind turbine structure for strain gauge pasting” ie., in mechanical load measurement of test turbine organized by IIT Madras on 12th August, 2013.



- ◆ “Measurement Uncertainty” organised by Bureau of Indian Standards (BIS), at BIS, Chennai on 10th to 12th February, 2014.

Wind Turbine Research Station

A. Mohamed Hussain, Scientist & Unit Chief

- ◆ 11th Governing Body meeting of Agency for Non-Conventional Energy and Rural Technology (ANERT), Trivandrum, Kerala State on 22nd May, 2013.
- ◆ An expert panel member during the panel discussion at the one day Work shop on “Energy & Environment” conducted by Kerala State Industrial Development Council (KSIDC), Trivandrum on 14th June, 2013.

Standards & Certification

A. Senthil Kumar, Scientist & Unit Chief

- ◆ Asia-Pacific Conference on Wind Engineering (APCWE-VIII) organized by SERC at Chennai during 10th to 14th December 2013.
- ◆ “Wind Energy in TN-Challenges and Constraints faced in tapping wind potential and its impact in the State Power situation and its improvements' organized by Tamil Nadu State Planning Commission in collaboration with Panchabuta – Renewable Energy and Cleantec on 18th June, 2013.
- ◆ “National Level Consultation on National Wind Energy Mission” held at New Delhi on 9th January, 2014.
- ◆ One-day knowledge sharing seminar on “Wind Measurement Testing and Certification” by M/s. DEWI GmbH and M/s. DEWI - OCC, GmbH along with Underwriters Laboratories (UL), India held at C-WET on 19th July, 2013.
- ◆ “Wind Tracer Doppler LIDAR, Wind prospector and Wind optimizer” presented by Mr. Arvinder S. Bara, CMD & Mr. Mike Margulis, Lockheed Martin coherent Technologies, USA on 12th April, 2013.
- ◆ “Wind Tunnel Testing for Assessment of Aerodynamic loads of flexible structures” and “Overview of Wind Engineering and Wind Energy Research and Education for ISU” by expert Dr. Partha P. Sarkar, Professor, Director, WiST Lab, IOWA State University, USA held at C-WET on 4th December, 2013.
- ◆ “UK- India offshore Wind Energy Workshop”, organized by UK Science & Innovation Network in partnership with Knowledge Economy UK Trade & investment and Energy, climate & Group at C-WET on 6th February 2014.
- ◆ “Wind-Solar Mapping Capabilities, Methodologies / Approaches” presented by Dr. Pascal Storck and Dr. Matt Hendrickson, VP, & Head (Assessment) of M/s. 3-TIER, Seattle, USA at C-WET on 27th February, 2014.



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- ◆ Seventeenth Electro technical Division Council (ETDC) meeting held at BIS, New Delhi on 18th July 2013.
- ◆ Meeting with Mr. Rajni Umakanthan, Business Head – India & MEA, M/s. UL India Private Limited and Mr. Holger Soker, Technical Director & Head of Mechanical Loads, M/s. DEWI GmbH on 22nd April 2013.
- ◆ Meeting with Mr. Holger Soker, Technical Director & Head of Mechanical Loads, M/s. DEWI GmbH on 22nd July 2013.
- ◆ Discussion with officials from M/s. UL India Private Limited at C-WET, Chennai on 29th October 2013.
- ◆ Meeting with Shri. Fabio pollicino Germanischer Lloyd, Germany and Shri. Dayton DRIFFIN Business Director, Renewable Energy Services, APAC, DNV KEMA Energy & Sustainability held at C-WET on 27th November 2013.
- ◆ Discussion with Canadian team along with Mr. Sylvian Charnonneau, Executive Vice President, Group Composites VCI held at C-WET on 29th November 2013.
- ◆ Meeting on “Offshore Wind Power in India” chaired by Secretary, MNRE, held at Chennai on 24th December 2013.
- ◆ Meeting with Mr. Saranpal “Sunny” Rai, Regional Vice President, Renewables (Commercial & Electrical), Intertek USA, Mr. Sandeep Das, Director (Strategy & Business Development) & Mr. Abhishek Chhabra, Manager (Strategic Business) of M/s. Intertek India at C-WET on 31st January 2014.
- ◆ Research Council meeting of C-WET held at C-WET, Chennai on 14th March 2014.

S. Arulselvan, Assistant Engineer

- ◆ One day work shop on “Power Quality and Energy Optimization” organized by Fluke India at Chennai on 31st May 2013.
- ◆ One-day knowledge sharing seminar on “Wind Measurement Testing and Certification” by M/s. DEWI GmbH and M/s. DEWI - OCC, GmbH along with Underwriters Laboratories (UL), India held at C-WET on 19th July, 2013.
- ◆ Regional phase of the International Training programme on “Wind Power Development and use” in Kanyakumari organized by LIFE ACADEMY, SWEDEN during the period 4th to 8th November, 2013.
- ◆ “Wind Tunnel Testing for Assessment of Aerodynamic loads of flexible structures” and “Overview of Wind Engineering and Wind Energy Research and Education for ISU” by expert Dr. Partha P. Sarkar, Professor, Director, WiST Lab, IOWA State University, USA held at C-WET on 4th December, 2013.



- ◆ “Wind-Solar Mapping Capabilities, Methodologies / Approaches” presented by Dr. Pascal Storck and Dr. Matt Hendrickson, VP, & Head (Assessment) of M/s. 3-TIER, Seattle, USA at C-WET on 27th February, 2014.

N. Raj Kumar, Scientist

- ◆ One-day knowledge sharing seminar on “Wind Measurement Testing and Certification” by M/s. DEWI GmbH and M/s. DEWI - OCC, GmbH along with Underwriters Laboratories (UL), India held at C-WET on 19th July, 2013.
- ◆ “Wind Tracer Doppler LIDAR, Wind prospector and Wind optimizer” presented by Mr. Arvinder S. Bara, CMD & Mr. Mike Margulis, Lockheed Martin coherent Technologies, USA on 12th April, 2013.
- ◆ “Wind Tunnel Testing for Assessment of Aerodynamic loads of flexible structures” and “Overview of Wind Engineering and Wind Energy Research and Education for ISU” by expert Dr. Partha P. Sarkar, Professor, Director, WiST Lab, IOWA State University, USA held at C-WET on 4th December, 2013.
- ◆ “UK- India offshore Wind Energy Workshop”, organized by UK Science & Innovation Network in partnership with Knowledge Economy UK Trade & investment and Energy, climate & Group at C-WET on 6th February, 2014.
- ◆ “Wind-Solar Mapping Capabilities, Methodologies / Approaches” presented by Dr. Pascal Storck and Dr. Matt Hendrickson, VP, & Head (Assessment) of M/s. 3-TIER, Seattle, USA at C-WET on 27th February, 2014.

Information, Training and Commercial Services

P. Kanagavel, Scientist & Unit Chief i/c

- ◆ One day National Workshop on “Skill Management in Library Services” organized by National College Library, Tiruchirapalli 21st April 2013.
- ◆ Direct Trainers Skill organized by Institute of Secretariat Training and Management (ISTM), New Delhi during 28th October to 1st November 2013.
- ◆ National Training Policy organized by Institute of Secretariat Training and Management (ISTM), New Delhi during 16th to 17th December 2013.

Engineering and Services Division

M. Anwar Ali, Scientist & Unit Chief

- ◆ “Wind Data Generator Software” by Mr. Karim Sasis from Meteopole Software, France at C-WET on 27th February 2013.
- ◆ Training on “Original Equipments Manufacturer (OEM)” at Geonica in Spain and “Calibration Lab” at Amsterdam, Spain.



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- ◆ Training on “Smart Grid-Technology and Applications” at CPRI, Bangalore.

Solar Radiation Resource Assessment

Dr. G. Giridhar, Scientist & Unit Chief

- ◆ International Renewable Energy Conference at Chennai Trade Centre during 9th to 11th May 2013.
- ◆ Discussion with MNRE officials in connection with the setting up of calibration laboratory at SEC / NISE, New Delhi during 7th to 9th October 2013.
- ◆ “Planning for Wind Power Training” at Hotel Raj Park, Chennai on 30th October, 2013.
- ◆ Parliamentary Committee Meeting at Madurai on 11th November, 2013.
- ◆ Indo-German Meeting at New Delhi on 13th November, 2013.
- ◆ Inauguration and launch of the Indian Renewable Energy Federation by Honorable Minister for Non-Conventional Energy Sources Dr. Farooq Abdullah at Delhi on 28th January, 2014.
- ◆ “Impact of Generation from Renewable Sources on Conventional Power Generation and Grid” organized by STEAG at New Delhi on 31st January, 2014.
- ◆ Assessing the solar Potential for Solar Purchase Obligation at Prathyusha College of Technology and Management (PITAM), Chennai.

R. Sasikumar, Scientist

- ◆ “Multi Lateral Solar and Wind working group” organized by IRENA and CEM, at India Habitat Centre, New Delhi on 16th April, 2013.
- ◆ Special interactive meet on solar insurance policy organized by Raasi Green Earth Energy Pvt. Ltd. in association with UIIC at Chennai on 14th March, 2014.

Prasun Kumar Das, Scientist

- ◆ Technical Committee meeting of SRRA under the Chairmanship of Joint Secretary at MNRE, New Delhi during 16th to 18th December 2013.
- ◆ Attended many meetings as a technical committee member in the tender document evaluation of Supply, Installation and Commissioning of 1000 nos. 5 Hp AC Solar PV pumping systems in Tamil Nadu implemented by Agricultural Energy Department, Tamil Nadu
- ◆ Technology Application Program on Solar Absorption Refrigeration Systems operating with Ionic Liquids in IIT, Madras on 21st & 22nd February, 2014.

R. Karthik, Scientist

- ◆ Technology Application Program on Solar Absorption Refrigeration Systems operating with Ionic Liquids in IIT, Madras on 21st & 22nd February, 2014.



Finance & Administration

D. Lakshmanan, General Manager

- ◆ "Global Round table on Government Performance Management" at Cabinet Secretariat, New Delhi during 11th & 12th December 2013.
- ◆ Two days training programme on Performance Monitoring and Evaluation System (PMES) organized by Institute Secretariat Training & Management at New Delhi during 3rd & 4th February 2014.

Shri P. Venkatesan, AAO

- ◆ Two days Training programme on "Purchase & Stores Management" organized by MSME, Chennai on 2nd & 9th June 2013.

R. Girirajan, Section Officer

- ◆ Four days Management training programme on "Accounting, Financial Management and Governance for Autonomous Bodies" organized by National Institute of Financial Management at Faridabad during 5th to 8th August 2013.
- ◆ One day workshop on "Employees Provident Fund" organized by MSME at Chennai on 18th August 2013.
- ◆ Three days training programme on "Finance Management for Finance & Non-financial Background Personnel" organized by Institute of Socio Economic Research & Action (ISERA) at New Delhi during 26th to 28th September 2013.
- ◆ One day Seminar on "Service Tax & Transfer Pricing" organized by SIRC of ICAI at Chennai on 18th February 2014.

K. Tamilselvi, Section Officer

- ◆ Four days Management training programme on "Accounting, Financial Management and Governance for Autonomous Bodies" organized by National Institute of Financial Management at Faridabad during 5th August 2013 to 8th August 2013.
- ◆ One day workshop on "Employees Provident Fund" organized by MSME at Chennai on 18th August 2013.
- ◆ Three days training programme on "Finance Management for Finance & Non-financial Background Personnel" organized by Institute of Socio Economic Research & Action (ISERA) at New Delhi during 26th to 28th September 2013.
- ◆ One day Seminar on "Service Tax & Transfer Pricing" organized by SIRC of ICAI at Chennai on 18th February 2014.



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Anuradha Babu, Private Secretary

- ◆ Three days training programme on "Effective Communication using IT" organized by Anna Institute of Management at Chennai during 12th to 14th June 2013.

V. Shanmugam, Assistant

- ◆ Two days Training programme on “ Purchase & Stores Management” organized by MSME, Chennai on 2nd & 9th June 2013.
- ◆ One day workshop on "Employees Provident Fund" organized by MSME at Chennai on 18th August 2013.
- ◆ One day Seminar on "Service Tax & Transfer Pricing" organized by SIRC of ICAI at Chennai on 18th February 2014.

B. Muthulakshmi, Senior Steno

- ◆ Two days Taining programme on “ Purchase & Stores Management” organized by MSME, Chennai on 2nd & 9th June 2013.
- ◆ One day workshop on "Employees Provident Fund" organized by MSME at Chennai on 18th August 2013.
- ◆ Three days training programme on "Finance Management for Finance & Non-financial Background Personnel" organized by Institute of Socio Economic Research & Action (ISERA) at New Delhi during 26th to 28th September 2013.

J. Rekha, Steno-Typist

- ◆ Three days training programme in Excel Advanced Applications organized by Anna Institute of Management at Chennai during 12th to 14th August 2013.
- ◆ Three days training programme on "Finance Management for Finance & Non-financial Background Personnel" organized by Institute of Socio Economic Research & Action (ISERA) at New Delhi during 26th to 28th September 2013.

T. Ganeshamoorthi, Steno-Typist

- ◆ Three days training programme on Introduction to MS-Access during 5th to 7th June 2013 organized by Anna Institute of Management at Chennai.

M. Selvakumar, Daftary

- ◆ Three days training programme in MS Word 2007 for Officers and Staff organized by Institute of Secretariat Training & Management at New Delhi during 9th to 11th September 2013.



TECHNOLOGY THINK TANK “TTT”

“TTT” - Lecture series on Thursdays at C-WET

In order to promote effective use of C-WET’s library, computational, experimental and other research infrastructural facilities on Thursdays, the “TTT” series lectures were organized to share knowledge / experience gained at C-WET. The following are the titles and speakers who have delivered lectures during the year.

Date	Topic	Speaker
02-01-2014	Thursday Think Tank Activity	Dr. S. Gomathinayagam
09-01-2014	Assessment of Noise Emission from a Wind Farm “ – A pilot Study in Tamilnadu	Mrs. G. Arivukkodi
16-01-2014	Validation of accuracy of WAsP in vertical wind shear profile prediction	Mr. Bastin Jeyaraj
23-01-2014	Instrument related to Small Wind Turbine Testing	Mr. R. Naveen Muthu
30-01-2014	Accomplishments and Advances in Wind Energy Technology	Mr. V. Santhosh Kumar
06-02-2014	Power Regulation Technique in Wind Turbines	Mr. S. Arulselvan
13-02-2014	Knowing your Operating System-Windows	Mr. M. Thirumalai
20-02-2014	Energiewende-Germany's Transition - A brief outline	Mr. S.D. Avinash Babhu
27-02-2014	Parabolic Trough Collector-Reliable CSP technology for power generation	Mr. Adhithya Babu
06-03-2014	Hardware Tools & Equipments used in WRA	Mr. N. Senthil Kumar
13-03-2014	Concentrated Solar Power- Its Application	Mr. D.S.L. Abhishek
20-03-2014	Techniques to improve the MTTR & MTBF for Wind Turbine Generators	Mr. S. Paramasivan
27-03-2014	Project Management Techniques	Mr. S. Arunkumar

PUBLICATIONS

Rajesh Katyal & Dr. S. Gomathinayagam, Offshore Wind Power Development in India - Its Future, Inwind Chronicle Magazine of Indian Wind Energy Association, New Delhi.

P. Kanagavel, S. Gomathinayagam, R.U. Ramasamy & S. Srinivasaragavan “Scientometric Analysis of Wind Power Research in India: A Case Study” Global Research Analysis International Vol. 2. Issue 6. [109-111], June 2013.

P. Kanagavel, S. Gomathinayagam, R.U. Ramasamy & S. Srinivasaragavan “A Scientometric Assessment of Wind Energy Research Productivity: A Scientometric Study” International Journal on Scientific Research Vol. 2. Issue 5. [33-36], May 2013.

INTERNATIONAL INTERACTION

VERTEX-CWET Indo-Spanish Wind Power Forecasting

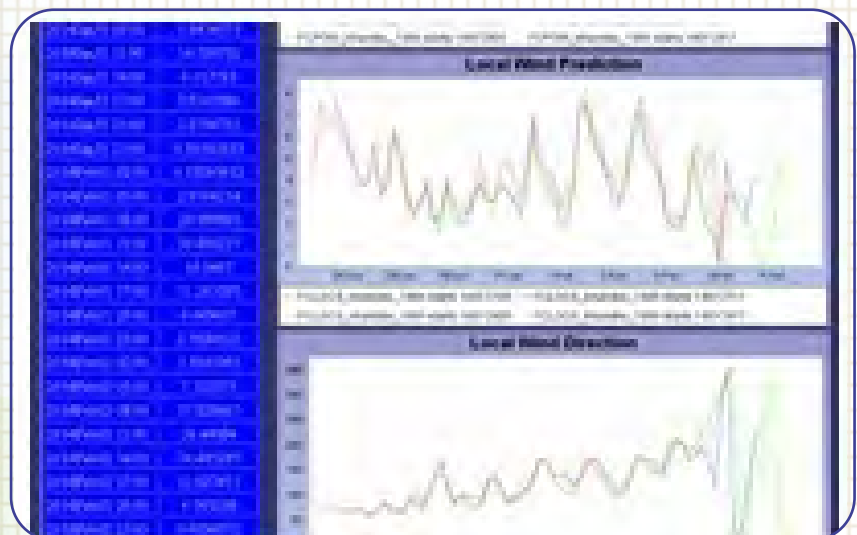
An MoU has been signed with Vortex for capacity building in wind power forecasting. As part of the MoU, C-WET has identified a wind farm in Tamil Nadu and provided necessary generation data to Vortex for training their model. Now, Vortex is providing forecasting for the selected wind farm. A comparison analysis has been made between actual and forecast data and found that the Mean Absolute Error is about 17-18% and Root Mean Squared Error is 23-27%. In order to reduce the error further, C-WET will provide real time data Supervisory Control and Data Acquisition (SCADA) to Vortex for further training of the model.

GIZ-CWET SRRA Project

GIZ, Germany is actively collaborating with C-WET-SRRA for data quality checking, data analysis and automation of report generation apart from their involvement in the ground-truthed SolMAP (Solar Atlas) preparation for India.

RISo/DTU - Denmark -C-WET Project

Under this project, RISO DTU submitted a draft interim report for the Khandke wind farm. RISO DTU used the Global Forecasting System (GFS) input data (both before and after the change)



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forecasting the wind power from the wind farm. After analysis of the forecast data they found that GFS data are not adequate for the completion of the planned tasks. In this connection, C-WET has provided data from National Centre for Medium Range Weather Forecasting (NCMRWF) to RISO and they have analyzed and submitted the draft report. The further analysis is in progress.

NREL-CWET US Project

The Scientist in Wind Turbine Testing has participated in an Inter Laboratory Comparison (ILC) with 18 accredited laboratories under the leadership of NREL under the group IEC TC 88 Certification Advisory Committee (CAC) for Test Laboratories.

International Training Programmes



Shri M.P. Ramesh releasing the Course Material

Two International training programmes were organized during this period, one under Indian Technical & Economic Cooperation (ITEC) & Special Commonwealth Assistance for Africa Programme (SCAAP) and the other under Africa India Forum Summit - II (AIFS-II) sponsored by Ministry of External Affairs (MEA) and supported by Ministry of New and Renewable Energy

(MNRE). International training programmes are generally designed for 3 to 4 weeks covering classroom lectures with practical and study visits to wind turbine manufacturing factories and wind farms.

About 45 lectures were scheduled and delivered by C-WET Scientists, Industrialists, Academicians, Entrepreneurs, Manufacturers, Consultants and other National Experts. During this period, about 44 participants across 3 continents have participated and the participants are mostly Government officials from Ministries who are in the process of implementing the introduction of renewable energy in their countries.

Practical training in Wind Resource Assessment, instrumentation, Testing equipment, R&D equipment were arranged. To provide hands on experience and study visits to the Large Wind Turbine manufacturing factory visits to Leitner Shriram Manufacturing Limited, Gummidipundi

and Gamesa Wind Turbines Pvt. Limited, Chennai were arranged. The participants had a chance of conceptualizing process of manufacturing Small Wind Turbine themselves after getting theoretical training and with the local materials at low cost at MinVayu facilities, Auroville. The participants also travelled to southern part of Tamil Nadu to visit Wind Turbine Test / Research Station, Kayathar and got to know about large and small wind turbine testing process. They also had an opportunity of visiting wind farms in and around Kanyakumari, where wind turbines are installed in large numbers like coconut trees.



Prof. J. S. Mani distributing the Course Certificate

10th International Training Programme

The 10th International Training Programme on "Wind Turbine Technology and Applications" was successfully organized by the Unit during 20th March – 12th April 2013 specially for African Countries sponsored under AIFS-II by Ministry of External Affairs (MEA), GOI and supported by MNRE, GOI. The programme was attended by 21 enthusiastic participants from 7 countries (Burundi, Cape Verde, Ethiopia, Libya, Nigeria, Tanzania and Uganda). The training programme was inaugurated by Shri. M. P. Ramesh, President, Wind World (India) Ltd. and the former Executive Director, C-WET. Participants were stayed at Kanyakumari during the study visit period and the experience at Cape



Shri. D. Jai Shankar inaugurating the Course

Centre for Wind Energy Technology

Comerin (southern tip of India) was so excited to the participants for viewing the sunrise & sunset and cultural visits showcasing the spiritual heritage of India. Prof. J. S. Mani, Head of the Department, Ocean Engineering, Indian Institute of Technology Madras was the Chief guest for the valedictory function and distributed the course certificate to the all the participants.

11th International Training Programme

The 11th International Training Programme on “Wind Turbine Technology and Applications” was successfully organized by the Unit during 4th September – 2nd October 2013. This is a special training course for Indian Technical and Economic Co-operation (ITEC) and Special Commonwealth Assistance for Africa Programme (SCAAP) partner Countries sponsored by the Ministry of External Affairs (MEA), GOI



Shri. K. C. Dhimole distributing the Course Certificate

under the ITEC / SCAAP programme and supported by the MNRE, GOI. The course was attended by 23 participants from 16 countries (Costa Rica, Mali, Malaysia, Oman, Myanmar, Sudan, Ethiopia, Syria, Thailand, Libya, Armenia, Nepal, Bhutan, Ghana, Mauritius & Zambia) The training programme was inaugurated by Shri. D. Jai Shankar, IA&AS, Protector of Emigrants, Ministry of Overseas Indian Affairs.

The 29 days programme included classroom lectures, field & factory visits and practical training sessions to provide complete knowledge transfer to the participants.

Shri. K. C. Dhimole, FIE, Technical Advisor to Chief Minister, Government of Arunachal Pradesh was the Chief Guest for the Valedictory Function and distributed the course certificates to the participants.

Contribution to International Electro-Technical Commission (IEC)

The Standard & Certification Unit reviews draft International Electro technical Commission (IEC) standards periodically forwarded by BIS and provide technical support to BIS on the voting draft IEC standards at IEC TC 88 Committee. ED, C-WET & Unit Chief, S&C participated in the discussions on the preparation of Standards during the Seventeenth Electro technical Division Council (ETDC) meeting held at BIS, New Delhi.



Visits Abroad

Dr. S. Gomathinayagam, Executive Director

- ◆ Accompanied Hon'ble Minister Dr. Farooq Abdullah, MNRE for official delegation to Turkey on Renewable Energy Cooperation from 25th to 27th June 2013.
- ◆ Visited Madrid, Spain in connection with the training at Original Equipment Manufacturer (OEM) M/s. Geonica SA, Madrid, Spain during the period 9th to 14th September 2013.
- ◆ Visited UK in connection with the training at UK India collaboration on "Off-Shore Wind Power Development in India" during the period of 29th September to 4th October 2013.

S.A. Mathew, Scientist & Unit Chief, WTT

- ◆ Invited as a nominee and participated in the 2013 International Conference on Alternate Energy in Developing Countries and Emerging Countries – 2013 AEDCEE and presented a paper on "Wind Resource Land Mapping using ArcGIS, WAsP and Multi Criteria Decision Analysis (MCDA) at Bangkok, Thailand during 30th – 31st May, 2013.
- ◆ Participated in the deliberations in the IEC CAC Advisory Sub Group on Test Laboratories in UK and USA for Power Curve Measurements as per the requirements of IEC 61400-12-1.

Dr. G. Giridhar, Scientist & Unit Chief, SRRA attended the "Course 1 on Energy Essentials for Decision Makers" in the Energy Training Week organized by International Energy Agency (IEA) during 6th -13th April 2013 at Paris.

S. Arulselvan, Assistant Engineer, S&C attended International Training Programme on "Wind Power Development and Use" organized by LIFE Academy, Sweden and sponsored by SIDA, held at Sweden during 8th to 24th April 2013.

A. Mohammed Hussain, Unit Chief & Scientist, WTRS visited Madrid, Spain in connection with the training at Original Equipment Manufacturer (OEM) M/s. Geonica SA, Madrid, Spain during the period 9th to 14th September 2013.

M. Anvar Ali, Unit Chief & Scientist, ESD visited Madrid, Spain in connection with the training at Original Equipment Manufacturer (OEM) M/s. Geonica SA, Madrid, Spain during the period 9th to 14th September 2013.

K. Boopathi, Scientist & Unit Chief, WRA

- ◆ Delivered lecture on "Offshore wind resource assessment" in the 3rd New Energy Forum - 2013 at Xian, China organized by Euro-Asia Economic Forum (EAEF-2013) organizing Committee, China during 25th to 28th September 2013.



Centre for Wind Energy Technology

- ◆ “Low Emissions Asian Development” (LEAD) programme sponsored by United States Agency for International Development (USAID) and the United States Department of Energy's National Renewable Energy Laboratory (NREL) and implemented by ICF International held at Bangkok, Thailand during 4th & 5th April 2013.
- ◆ “Evaluation of Wind SIM in Indian Complex Terrain – case study” in the 10th Annual user meeting of Windsim and attended advanced Windsim software training at Tonsberg, Norway during 16th to 25th June 2013.

A. Haribhaskaran, Scientist

- ◆ WAsP, WAsP Engineering and WAsP Certification course at RISO DTU, Denmark from 16th to 28th June 2013.
- ◆ Successfully cleared the examination conducted by RisoDTU, Denmark in connection with WAsP Certification.

T. Suresh Kumar

- ◆ WAsP, WAsP Engineering and WAsP Certification course at RISO DTU, Denmark from 16th to 28th June 2013.

R. Vinodkumar, Technician

- ◆ WAsP, WAsP Engineering and WAsP Certification course at RISO DTU, Denmark from 16th to 28th June 2013.
- ◆ Successfully cleared the examination conducted by Riso DTU, Denmark in connection with WAsP Certification.

GENERAL INFORMATION

GOVERNING COUNCIL		
The following are the members of the Governing Council & Annual General Body (To administer and guide the affairs of the Centre)		
1.	Shri. Rattan P Watal, I.A.S., Secretary, MNRE, New Delhi,	President of the Society and Chairman
2.	Shri. Rajesh Lakhoni, I.A.S., Principal Secretary to Government Energy Department, GOTN, Chennai	Member
3.	Shri. Alok Srivasatava, I.A.S., Joint Secretary (Wind Energy) MNRE, New Delhi	Member
4.	Shri. J B Mohapatra, I.R.S., Joint Secretary and Financial Adviser, MNRE, New Delhi	Member
5.	Shri. Sunil Soni, I.A.S., Director General, BIS, New Delhi	Member
6.	Major Singh Member Planning, CEA, New Delhi	Member
7.	Shri. Shyam Chetty, Director, NAL, Bangalore	Member
8.	Shri. Debasish Majumdar, Chairman & Managing Director, IREDA, New Delhi	Member
9.	Shri. S.K. Soonee, CEO, Power System Operation Corporation Limited, New Delhi and Chairman, R&D Council, C-WET	Member
10.	Shri. Ramesh Kymal Chairman, IWTMA, Chennai	Member
11.	Dr. S. Gomathinayagam, Executive Director, C-WET, Chennai	Member Secretary

MANAGEMENT COMMITTEE

**The following are the members of the Management Committee
(To take decisions as and when required and to inform GC from time to time)**

1.	Chairman, Governing Council, C-WET	Chairman
2.	Financial Adviser, MNRE	Member
3.	Executive Director, C-WET	Member

FINANCE COMMITTEE

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

1.	Shri. J.B. Mohapatra, I.R.S., Joint Secretary & Financial Adviser, MNRE, New Delhi	Chairman
2.	Shri. Rajesh Lokhani, I.A.S., Principal Secretary to Government, Energy Department, Tamil Nadu Government	Member
3.	Shri. Alok Srivasatava, I.A.S, Joint Secretary (Wind Energy), MNRE, New Delhi	Member
4.	Dr. S. Gomathinayagam, Executive Director, C-WET, Chennai	Member
5.	Shri. Dilip Negam, Director (Wind Energy), MNRE, New Delhi	Member
6.	Shri. R.P. Batra, Deputy Secretary (Finance) MNRE, New Delhi	Member
7.	Shri. D. Lakshmanan, General Manager (F&A), C-WET, Chennai	Member Secretary

RESEARCH AND DEVELOPMENT COUNCIL

The following are the members of the Research and Development Council (To guide C-WET on laying down Research direction to serve the Indian Wind Energy Sector)

1	Shri. S.K. Soonee, CEO, Power System Operation Corporation Ltd New Delhi – 110 016	Chairman
2	Shri. Alok Srivastava, I.A.S, Joint Secretary Ministry of New and Renewable Energy, New Delhi – 110 003	Member
3	Dr. B. S. K. Naidu. Ex-Director General, NTPI & CPRI and Chairman Great Lakhs IEMR, NCR, New Delhi	Member
4	Shri. Y. K. Sehgal, Executive Director (Smart Grid) Power Grid Corporation of India Ltd, Gurgaon – 122 001	Member
5	Smt. K. A. Fathima, Former Senior Director – C-DAC, Trivandrum – 695 030	Member
6	Shri. S. C. Bhan, Scientist-E, India Meteorological Department New Delhi – 110 003	Member
7	Shri. R. P. Mehrotra, DGM, M/s. Engineers India Ltd, New Delhi – 110 066	Member
8	Dr. N.K.Singh, Addl. General Manager Bharat Heavy Electricals Ltd, Hyderabad – 502 032	Member
9	The Chairman, Indian Wind Turbine Manufacturers Association, Chennai	Member
10	Dr. S. Gomathinayagam, Executive Director Centre for Wind Energy Technology, Chennai – 600 100	Member
11	Shri. Rajesh Katyal, Unit Chief , R&D Centre for Wind Energy Technology, Chennai – 600 100	Member Secretary

EMPANELMENT COMMITTEE ON SMALL WIND TURBINE

The following are the members of the Empanelment Committee on Small Wind Turbine (To review the status of various manufacturers of small wind energy system and their recommendations for empanelment of MNRE / CWET approved manufacturers)

1	Executive Director, C-WET	Chairman
2	Director, MNRE dealing with the SWES Programme	Member
3	Outside Expert – Shri. M.K. Deb, CECL, Bhopal	Member
4	Outside Expert – Prof. A.P.Haran Park College of Engineering, Coimbatore	Member
5	Representative from Industry, if needed in a particular meeting	Invitee
6	Rajesh Katyal, Unit Chief, R&D, C-WET	Member Secretary

REVISED LIST OF MODELS AND MANUFACTURERS OF WIND TURBINES (RLMM) COMMITTEE

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

1	Dr. S. Gomathinayagam, Executive Director, C-WET	Chairman
2	Shri. Dilip Nigam, Director (Wind Energy), MNRE	Member
3	Shri. A. A. Khatana, Executive Director, IREDA	Member
4	Shri. V. Balaji, DGM, SRLDC	Member
5	Shri. Ramesh Kymal, Hon.Chairman, IWTMA, Chennai (till Jan '14)	Member
6	Shri. Madhusudan Khemka, Chairman, IWTMA, Chennai (from Feb'14)	Member
7	Shri. K. Kasthurirangaian, Chairman, IWPA, Chennai	Member
8	Shri. A. Senthil Kumar, Unit Chief, S&C, C-WET	Secretary

PROTOTYPE WIND TURBINE MODELS COMMITTEE

The following are the members of the Prototype Wind Turbine Models Committee

1	Dr. S. Gomathinayagam, Executive Director, C-WET	Chairman
2	Shri. Mohamed Hussain, Director, MNRE & Unit Chief, WTRS, C-WET	Member
3	Shri. Siddhartha Bhatt, Additional Director, CPRI, Bangalore	Member
4	Shri. D.V. Giri, Secretary General, IWTMA, Chennai	Member
5	Shri. A. Senthil Kumar, Unit Chief, S&C, C-WET	Member Secretary

HINDI PROMOTION COMMITTEE

The following are the members of the Hindi Promotion Committee
(Constituted for the purpose of promotion of Hindi Official Language in C-WET)

1.	Executive Director, C-WET	Chairman
2.	Shri. Rajesh Katyal, Scientist & Unit Chief, R&D, C-WET	Member Secretary
3.	Shri. D. Lakshmanan, General Manager, F&A, C-WET	Member
4.	Admin & Accounts Officer, C-WET	Member
5.	Shri. P. Kanagavel, Scientist & Unit Chief (i/c), ITCS, C-WET	Member

Vigilance Awareness Week

Vigilance awareness week for the year 2013 was observed in C-WET from 28th October to 2nd November 2013 and all the employees have taken a pledge as instructed by the Central Vigilance Commission.

National Day Celebrations



The Independence day and the Republic day were celebrated with reverence at the C-WET Campus. The Events begin with a parade of security personnel at C-WET followed by flag hosting and concluded with distribution of Sweets.

Committee for prevention of sexual harassment of women at work place

In pursuance of Government instructions, a Complaints Committee for Women for redressal of complaints concerning sexual harassment in work place has been constituted in C-WET and the Committee conducted its quarterly meetings on 21st May 2013, 23rd August 2013, 26th November 2013 & 3rd January 2014. No complaints received during the year 2013-14.

Foundation Day

Foundation day was celebrated in C-WET on 21st March 2014. Shri D. Majumdar, Ex. CMD, IREDA was invited as chief guest and he delivered the foundation day lecture.



C-WET Foundation Day Lecture by Shri. D. Majumdar

Promotions during the year 2013-14

Sl. No.	Name	Previous Cadre and pay band	Promoted Cadre and Scale of pay	Date of Promotion
1.	Shri. J.C. David Solomon	Scientist 'C' Rs.15,600 - 39,100/- + G.P. Rs. 6,600/-	Scientist 'D' Rs.15,600/- 39,100/- + G.P. Rs. 7,600/-	01.01.2013

Recruitments & Functional Unit Transfer

- ♦ Mr. J. Bastin has been newly appointed as Scientist 'B' in WRA Unit from 15th June 2013 (FN) onwards.
- ♦ Ms. M. C. Lavanya has been newly appointed as Scientist 'B' in WRA unit with effect from 16th December 2013 onwards.
- ♦ Mr. A. G. Rangaraj, Scientist 'B' has been transferred from S&C Unit to WRA unit with effect from 1st August 2013 (FN) onwards.

Functional Unit - Transfer

- ♦ Mr. M. Joel Franklin Asaria, Scientist 'D', MNRE has been posted to WRA Unit with effect from 10th December 2013 onwards.
- ♦ Mr. A. Haribhaskaran, Scientist – B reversion back to MNRE from 1st September 2013.

Promotion and Implementation of Official Language

- ♦ C-WET has been an active member in the Town Official Language Implementation Committee, Chennai.
- ♦ OLIC meeting is being conducted in C-WET quarterly.
- ♦ Annual Report of C-WET is being published in bilingual (Hindi & English) and is laid on the table of Parliament House also it is uploaded in the website of C-WET.
- ♦ The quarterly news letter “PAVAN” is being published in bilingual (Hindi & English) and it is also uploaded in the website of C-WET.
- ♦ OL Act 3 (3) and Rule of Official Language are implemented in C-WET.
- ♦ Hindi fortnight was celebrated in C-WET from 14.09.2013 to 28.09.2013.
- ♦ Seven Hindi Program/competitions were conducted, 66 participants of C-WET took part and prizes to the winners were distributed on the Valedictory Day of the Program.

Right to Information Act

During the year 2013-14, 12 applications were received seeking information under RTI Act, 2005 and requisite details have been given. No appeal has been preferred against the decision of CPIO.

Parliamentary Standing Committee visit

On-the-spot study visit of the Standing Committee on Energy (2013-14) held at Guwahati, Gangtok, Darjeeling and Kolkata during 7th to 12th June 2013.

On-the-spot study visit of the Standing Committee on Energy (2013-14) held at Madurai during 11th November 2013.



Implementation of Persons with Disabilities Act 1995

The following facilities are being available to Persons with Disabilities

1. Though C-WET is functioning in a two storey building (where lift is not mandatory) a lift has been provided for the convenience of physically challenged.
2. A separate ramp has been provided to enable use of crutches / wheel chairs.
3. Low level steps laid by the side of the lift for easy access.
4. Post reservation for physically handicapped as per GOI rules.

HUMAN RESOURCE

Sl.No.	Name	Cadre
OFFICE OF EXECUTIVE DIRECTOR		
1.	Dr. S. Gomathinayagam	Executive Director
2.	Ms. Anuradha Babu	Private Secretary
3.	Shri. T. Ganeshamoorthi	Steno-Typist
FINANCE & ADMINISTRATION		
1.	Shri. D. Lakshmanan	General Manager (F&A)
2.	Shri. R. Girirajan	Section Officer
3.	Ms. K. Tamilselvi	Section Officer
4.	Ms. B. Muthulakshmi	Senior Steno
5.	Ms. J. Rekha	Steno-Typist
6.	Shri. V. Shanmugam	Assistant
7.	Shri. M. Selvakumar	Daftary
8.	Shri. M. Malaravan	Senior Driver
9.	Shri. S. Maruthanayagam	Driver
RESEARCH & DEVELOPMENT		
1.	Shri. Rajesh Katyal Unit Chief	Scientist 'E'
2.	Shri. J.C. David Solomon	Scientist 'D'
3.	Ms. Deepa Kurup	Scientist 'C'
4.	Shri. M.R. Gunasekaran	Senior Steno
5.	Shri. R. Naveen Muthu	Technician
WIND RESOURCE ASSESSMENT		
1.	Shri. K. Boopathi Unit Chief i/c	Scientist 'C'
2.	Shri. A.G. Rangaraj	Scientist 'B'
3.	Shri. J. Bastin	Scientist 'B'
4.	Ms. M.C. Lavanya	Scientist 'B'
5.	Ms. G. Arivukkodi	Assistant Engineer



S.No.	Name	Cadre
6.	Shri. T. Suresh Kumar	Junior Engineer
7.	Shri. B. Krishnan	Junior Engineer
8.	Shri. R. Vinod Kumar	Technician
9.	Shri. K.A. Haji Abdul Ibrahim	Daftary
WIND TURBINE TESTING		
1.	Shri. S.A. Mathew Unit Chief	Scientist 'D'
2.	Shri. M. Saravanan	Scientist 'B'
3.	Shri. Bhukya Ramdas	Scientist 'B'
4.	Shri. M. Karuppuchamy	Assistant Engineer
5.	Shri. A.R. Hasan Ali	Assistant Engineer
6.	Shri Y. Packiyaraj	Assistant Engineer
7.	Shri. S. Paramasivan	Junior Engineer
STANDARDS & CERTIFICATION		
1.	Shri. A. Senthil Kumar Unit Chief	Scientist 'D'
2.	Shri. N. Rajkumar	Scientist 'B'
3.	Shri. S. Arulselvan	Assistant Engineer
INFORMATION, TRAINING AND COMMERCIAL SERVICES		
1.	Shri. P. Kanagavel Unit Chief i/c	Scientist 'C'
ENGINEERING SERVICES DIVISION		
1.	Shri. M. Anvar Ali Unit Chief	Scientist 'D'
2.	Shri. C. Stephen Jeremias	Junior Engineer
CONTRACT STAFF IN SOLAR RADIATION RESOURCES ASSESSMENT		
1.	Shri. Prasun Kumar Das	Scientist 'B'
2.	Shri. R. Karthik	Scientist 'B'
WIND TURBINE RESEARCH STATION, KAYATHAR		
1.	Shri. A. Mohamed Hussain Unit Chief	Scientist 'E'
2.	Dr. G. Giridhar	Scientist 'E'
3.	Shri Joel Franklin Asaria	Scientist 'D'

C-WET OFFICIALS ON EXTERNAL COMMITTEES, BODIES AND MEMBERSHIP OF ASSOCIATIONS

S. Gomathinayagam

- Institution of Engineers (India), Life Member / Chartered Engineer.
- Computer Society of India, Life Member.
- Instrument Society of India, Life Member.
- Indian Society of Wind Engineers, Life Member.
- Indian Meteorological Society, Life Member.
- External Examiner of UGC-JRF PHD program for MIT, Anna University, Member.
- Expert Advisory Committee, Tamil Nadu, Scientists Award- (TANSA) - 2008 for Engineering and Technology.
- Executive Committee Member of Institute of Energy Studies, Anna University, Chennai.
- Member of Monitoring Committee, NIMITLI, Wind Turbine Development Project of CSIR.
- Chairman, Wind Turbine Sectional Committee ET42 of B/S.

D. Lakshmanan

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

Rajesh Katyal

- Institution of Engineers (India), Member.

A. Senthil Kumar

- Wind Turbines Sectional Committee, ET 42 of BIS, Member.

P. Kanagavel

- Society for the Advancement of Library and Information Science (SALIS), Member.
- Indian Academic Library Association (IALA), Member.

AUDITOR'S REPORT

R. JANAKIRAMAN & CO.,
Chartered Accountants



New No: 6, Old No: 43,
Maharaja Surya Rao Road,
Alwarpet, Chennai - 600 018.

Partners :

CA. R. JANAKIRAMAN B.Com, FCA
CA. J. CHANDRASEKARAN B.Sc, FCA
CA. C. GEETHA B.Com, AICWA, FCA, DISA, CISA, CISM
CA. K. CHANDRA MOULI B.Sc, FCA, MS.MBIM(UK), DISA, CISA

CA. C. SHANMUKHAM B.Com, FCA
CA. B. CHANDRAN B.Com, FCA
CA. T.V.V. NARAYANAN B.Com, FCA, DISA

The Chairman
Governing Council
Centre for Wind Energy Technology
Chennai – 600 100

INDEPENDENT AUDITORS' REPORT

Sir,

We have audited the attached financial statements of Centre for Wind Energy Technology (C-WET), Velachery – Tambaram, Pallikaranai, Chennai, which comprise the Balance sheet as at 31.03.2014, the Income & Expenditure Account and the Receipts and Payments Account for the year then ended and a summary of significant accounting policies and other explanatory information.

Management's Responsibility:

C-WETs' Management is responsible for the preparation of these financial statements that give a true and fair view of the financial position, financial performance and cash flows of the C-WET in accordance with the Accounting Standards issued by the institute of chartered accountants of India. This responsibility includes the design, implementation and maintenance of internal controls relevant to the preparation and presentation of the financial statements that give a true and fair view and are free from material misstatement, whether due to fraud or error.

Auditors' Responsibility:

Our responsibility is to express an opinion on these financial statements based on our audit. We conducted our audit in accordance with the Standards on auditing issued by the Institute of chartered Accountants of India. Those standards require that we comply with the ethical requirements and plan and perform the audit to obtain reasonable assurance about whether the financial statements are free from material misstatements.

An audit involves performing procedures to obtain audit evidence about the amounts and the disclosures in the financial statements. The procedures selected depend on the auditor's judgment, including the assessment of the risks of material misstatement of the financial statements, whether due to fraud or error. In making those risk assessments, the auditor considers internal control relevant to C-WETs' preparation and fair presentation of the financial statements in order to design audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of the C-WETs' internal control. An audit also includes evaluating the appropriateness of the accounting policies used and reasonableness of the accounting estimates made by the management, as well as evaluating the overall presentation of financial statements. We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our audit opinion.

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rjco1960@gmail.com

Phone : 24352596
24352597

Mobile : 93810 51212 / 98401 22090
98407 56873

R. JANAKIRAMAN & CO.,
Chartered Accountants

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Opinion:

- a) In our opinion and to the best of our information and according to the explanations given to us, the aforesaid financial statements, including the Balance Sheet, Income & Expenditure Account and Receipts and Payments Account dealt with by this report read together with 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 Balance Sheet, of the state of affairs of the above mentioned Centre as at 31st March, 2014;
 - ii. in the case of Income & Expenditure account of the Excess of Income over expenditure of this Centre for the year ended on that date; and
 - iii. in the case of Receipts and payments Account of the Receipts and Payments of this Centre for the year ended on that date.

Report on Other Legal and Regulatory Requirements

We report that:

- a) We have obtained all information and explanations which to the best of our knowledge and belief were necessary for the purpose of our audit;
- b) In our opinion, proper books of account have been kept by the above mentioned Centre so far as appears from our examination of the books;
- c) The Balance Sheet, Income & Expenditure Account and Receipts and Payments Account referred to in this report are in agreement with the books of accounts;
- d) In our opinion the Balance Sheet, Income and Expenditure Account and Receipts and Payments Account dealt with by this report are prepared in accordance with the applicable Accounting Standards issued by the Institute of Chartered Accountants of India.

FOR R.JANAKIRAMAN & CO
CHARTERED ACCOUNTANTS
FRN: 001263S

Place: CHENNAI
Date:

J.Chandrasekaran,
PARTNER
M.NO.027861

BALANCE SHEET AS AT 31st MARCH, 2014

CENTRE FOR WIND ENERGY TECHNOLOGY

(An Autonomous R&D Institution under MNRE, Government of India)

Chennai - 600 100

(Amount in Rs.)

FUND AND LIABILITIES	Schedule	31 st March, 2014	31 st March, 2013
CAPITAL ASSET FUND	1	29,06,88,615	20,90,98,061
RESERVES AND SURPLUS	2	36,13,16,521	32,51,33,682
CURRENT LIABILITIES AND PROVISIONS	3	17,81,38,165	16,28,62,440
TOTAL		83,01,43,301	69,70,94,183
ASSETS			
FIXED ASSETS			
(a) Created out of Central Government Grants	4	28,80,39,813	20,86,19,323
(b) Out of Internal Generation Grants		26,48,802	4,78,738
CURRENT ASSETS, LOANS AND ADVANCES	5	53,94,54,686	48,79,96,122
TOTAL		83,01,43,301	69,70,94,183
SIGNIFICANT ACCOUNTING POLICIES	13		
NOTES ON ACCOUNTS	14		

For Centre for Wind Energy Technology

As per our Report attached
for **R. Janakiraman & Co.,**
Chartered Accountants
Firm Regn No.001263S

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

Sd/-
Dr. S.Gomathinayagam
Executive Director

Sd/-
President/
Chairman

Sd/-
J.Chandrasekaran
Partner
Membership No.027861

RECEIPTS AND PAYMENTS ACCOUNT

CENTRE FOR WIND

(An Autonomous R & D Institution under Ministry of
Chennai

RECEIPTS	31 st March, 2014	31 st March, 2013
I. Opening Balances		
(a) Cheques in hand		3,05,397
(b) Bank balances		
i) In Current Account	22,52,216	96,16,883
ii) In Savings Bank Account	3,23,07,636	3,96,79,366
iii) In Deposit Accounts	36,00,00,000	27,00,00,000
(c) Stamps on hand	2,472	622
	39,45,62,323	31,96,02,268
II. Grants Received		
(a) From Government of India	14,00,00,000	20,00,00,001
(b) Sale of Fixed Assets	(74,740)	9,78,687
(c) From Government of India for execution various projects/General Reserve	2,37,02,711	(1,52,35,748)
(d) From Government of India for SRRA Project	21,75,00,000	2,00,00,000
III. Income on Investments		
IV. Interest Received		
(a) On Bank deposits	2,45,25,660	2,59,29,469
(b) On Bank deposits SRRA	23,22,317	16,15,138
V. Other Income		
(a) Fees for services	4,00,26,648	5,00,32,171
(b) Income from publications	1,43,365	2,28,450
(c) Energy receipts	4,84,11,746	2,56,67,241
(d) Misc. Income (including SRRA Income)	62,32,627	1,66,72,393
VI. Amount borrowed		
VII. Any other receipts		
(a) Fees received in advance on Consultancy projects	8,39,10,250	3,45,39,950
(b) Security deposit received	25,73,932	92,72,247
(c) Security deposit received SRRA	39,300	
(d) Earnest money deposit received	45,18,000	76,57,000
(e) Earnest money deposit received SRRA	9,26,580	80,000
(f) Service tax realised	93,19,538	51,61,294
(g) Service tax realised SRRA	1,77,798	1,20,647
(h) TDS to be remitted (Including SRRA)	5,66,463	3,62,912
(i) Advances and Deposits - CFA	2,73,489	53,96,268
(j) Advances and Deposits - SRRA		5,37,644
(k) Advances and Deposits - IE	17,37,032	
(l) Receivable from Debtors/other payments	3,39,79,131	
(m) Performance Guarantee	86,789	
	64,08,98,636	38,90,15,764
TOTAL	1,03,54,60,959	70,86,18,033

FOR THE YEAR ENDED 31st MARCH 2014

ENERGY TECHNOLOGY

New and Renewable Energy, Government of India)

600 100

(Amount in Rs.)

PAYMENTS	31 st March, 2014	31 st March, 2013
I. Expenses		
(a) Employee related Expenses	3,49,28,684	2,82,90,511
(b) Administrative Expenses	4,94,80,985	3,09,60,411
II. Payments made against funds for various projects		
Out of CFA		
(a) In house R&D project expenses	13,53,05,781	6,85,90,954
(b) Seminar & Information dissemination	10,58,030	17,84,708
(c) Accreditation fee	59,243	61,822
Out of Grants for projects		
(a) WRA Lakshadweep	1,50,600	
(b) Wind Profile Measurment - Dhanushkodi	1,46,55,134	7,72,890
(c) WRA Kargil		3,52,283
(d) Wind Shear Assessment expenses 120Mast	52,80,774	8,66,663
(e) North-Eastern Project 2006-07	16,15,397	1,91,785
(f) Study on Uncovered / New areas (2003-04 to 2010-11)	1,21,38,358	1,26,77,200
(g) Wind forecasting		9,99,122
(h) Solar Radiation Resource Assessment	1,29,19,381	2,17,34,331
III. Investment and Deposits made		
IV. Expenditure on Fixed assets & Capital Work-in-Progress		
(a) Purchase of Fixed assets (CFA)	1,49,69,141	2,86,51,399
(b) Purchase of Fixed assets (Internal Generation)	28,78,148	6,45,660
(c) Expenditure on Capital Work-in-progress	(23,21,263)	24,64,564
(d) Advance on capital account (including imports) CFA	92,12,247	98,533
(e) Advance on capital account (including imports) IE	24,227	
(f) Purchase of Fixed assets (SRRA)	11,66,18,345	
V. Refund of Surplus Money		
(a) Balance of Grants-in-aid to Government of India		2,20,300
VI. Other Payments		
(a) Refund of Security deposits	56,59,683	56,83,307
(b) Refund of Security deposits SRRA	49,100	
(c) Refund of Earnest Money Deposits	17,33,000	1,51,14,500
(d) Refund of Earnest Money Deposits SRRA	20,000	60,000
(e) Expenditure on Consultancy Projects	3,17,46,458	2,22,79,787
(f) Advance & Deposits - CFA	14,54,400	1,90,12,860
(g) Advance & Deposits - SRRA	2,65,00,045	
(h) Advance & Deposits - IE	14,83,580	
(i) Payment of TDS	3,29,612	6,75,952
(j) Service tax remittances	93,19,538	50,72,722
(k) Service tax remittances SRRA	1,77,798	1,05,061
(l) Receivable from Debtors/other payments	59,88,922	(45,34,035)
(m) Festival advance paid	(7,500)	16,125
(n) Transfer of fees received in advance	4,37,78,482	5,12,06,295
VII. Closing Balances		
(a) Cheques in hand		7,234
(b) Bank Balances		
i) In Current Account	19,11,291	22,52,216
ii) In Savings Bank Account	13,63,33,440	3,23,00,402
iii) In Deposit Accounts	36,00,00,000	36,00,00,000
(c) Stamps in hand	9,899	2,472
TOTAL	1,03,54,60,959	70,86,18,033

For Centre for Wind Energy Technology

As per our Report attached
for **R. Janakiraman & Co.,**
Chartered Accountants
Firm Regn No.001263S

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

Sd/-
Dr. S.Gomathinayagam
Executive Director

Sd/-
President/Chairman

Sd/-
J.Chandrasekaran
Partner, Membership No.027861

INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED 31st MARCH, 2014

CENTRE FOR WIND ENERGY TECHNOLOGY

(An Autonomous R&D Institution under MNRE, Government of India)

Chennai - 600 100

(Amount in Rs.)

INCOME	Schedule	31 st March, 2014	31 st March, 2013
Income from Scientific & Technical Consultancy Services	6	6,60,88,636	7,45,17,497
Income from publication	7	24,19,350	23,79,000
Interest Earned	8	2,45,20,172	2,46,65,951
Other Income	9	1,95,97,767	1,51,08,568
Grants from Government of India allocated for Revenue expenditure during the year	3.1	3,42,30,629	3,07,80,953
Grants from Government of India allocated for in house project expenditure during the year	3.1	16,31,39,611	3,80,65,037
Closing stock		19,88,407	22,23,276
TOTAL (A)		31,19,84,572	18,77,40,282
EXPENDITURE			
Opening stock		22,23,276	16,12,384
Establishment Expenses	10	3,30,12,710	2,85,38,450
Other Administrative Expenses	11	7,45,47,988	5,26,38,714
In house project expenditure		16,31,39,611	3,80,65,037
TOTAL (B)		27,29,23,585	12,08,54,585
Balance being excess of Income over Expenditure (A-B)		3,90,60,987	6,68,85,697
Prior period adjustment	12		(6,254)
Transfer to Capital Asset Fund	4	28,78,148	6,45,660
BALANCE BEING SURPLUS TRANSFERRED TO GENERAL RESERVE FUND		3,61,82,839	6,62,46,291
SIGNIFICANT ACCOUNTING POLICIES	13		
NOTES ON ACCOUNTS	14		

For Centre for Wind Energy Technology

As per our Report attached
for R. Janakiraman & Co.,
Chartered Accountants
Firm Regn No.001263S

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

Sd/-
Dr. S.Gomathinayagam
Executive Director

Sd/-
President/
Chairman

Sd/-
J.Chandrasekaran
Partner
Membership No.027861



पवन ऊर्जा प्रौद्योगिकी केन्द्र CENTRE FOR WIND ENERGY TECHNOLOGY

नवीन और नवीकरणीय ऊर्जा मंत्रालय, अधीन स्वायत्त अनुसंधान एवं विकास संस्था, भारत सरकार
An Autonomous R & D Institution, Ministry of New and Renewable Energy, Government of India

वेलचेरी - ताम्बरम प्रमुख मार्ग, पल्लिकरनै, चेन्नई - ६०० १००, तमिलनाडु, भारत
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