

ISSUE - 25
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EDITORIAL



So far, in this column, we have discussed importance of focus on R&D in the wind energy in the industries in India in collaboration with C-WET, developments in small wind energy systems, offshore wind power, preparedness of C-WET for industry sponsored researches and the need of repowering and inter-cropping in wind farms, in the recent five issues.

We know wind is the main stay in renewable energy in India and as on 31st March, 2010, the Grid Connected installed capacity of wind power is 11807 MW and the distributed is 402 MW totaling to 12209 MW. But due to infirmity of wind, the State Electricity Boards are not comfortable to mix the wind generated electricity in the overall electricity generation using conventional sources. This requires series contribution for sustaining the growth of wind power with the convertible energy mix in utility systems in India. To make the wind penetration successful in the energy mix, we need to adopt wind forecasting, effective load dispatching, demand side management using smart GRID concepts & advanced 'WEG' technologies.

If one looks at latest technological developments, the British crossing 2 GW offshore wind power with Round 3 projects of Crown Estate (the offshore & coastal zone managers), Chinese 'Maglev' breakthrough in wind energy technology, Virginia based catch the wind's Laser Wind Sensor (LWS) and Optical Air Data Systems (OADS) based on LiDAR (Light Detection and Ranging), Leviathan Energy's wind energizer techniques of low cost wind turbine technology of the WTC (Wind Turbine Company of USA) will just form a small list. In terms of innovations of megawatt class, Clipper's 4 MW, Repower's 6 MW and the America's 10 MW offshore research wind turbine are gaining shape.

C-WET's R&D unit had completed testing of Small Wind Turbine / aero-generators 1kW and 5 kW models at its test bed at WTTS, Kayathar. The unit has collected details of over 30 Small Wind Energy System (SWES) from several manufacturers in India and released the first list of empanelment based on the revised MNRE guidelines for SWES. Erection of 2 MW experimental wind turbine at C-WET's Kayathar WTTS facility was completed in February 2010 and precommissioning activities have been initiated. R&D council meeting was held at C-WET.

In WRA unit 3 new Wind Monitoring Stations in Andaman & Nicobar Islands have been established with 50 m tall masts. Presently, 91 Wind Monitoring Stations are operational in 20 States and one Union Territory under various wind monitoring projects funded by the Ministry as well as various entrepreneurs. Projects on Verification of procedure of wind monitoring have been done for 11 sites in Maharashtra & 7 Site Validation & Generation Estimate for the proposed wind farm projects.

Indian Wind Atlas, a data book containing the wind resource availability across the Indian continent for harnessing Wind Energy was released on 29th April 2010 by Hon'ble Minister, New and Renewable Energy, Govt. of India Dr. Farooq Abdullah. The present Indian Wind Atlas can be used in all three stages (Large area screening, validation with measurements and micro-siting) of wind resource assessment according to the available details of inputs for each stage. This book will certainly empower equally the industry, academia and researchers to exploit wind as a viable green power in India at a much faster rate in future.

The Testing unit carried out a detailed market survey along with M/s. BLAEST, Denmark and IWTMA for the establishment of a National facility for Blade Testing at Chennai. Mr. Carsten Skamris, Managing Director & Mr. Peter Ellegaard, Senior Executive from M/s. BLAEST, Denmark visited C-WET 08th to 14th June, 2010 in connection with the establishment of a National facility for Wind Turbine Blade Testing.

The S&C unit updated RLMM main list has been issued on 18.05.2010. Addendum to this list will be issued as per demand on a quarterly basis.

The ITCS Unit organised on June 15, C-WET's Global Wind Day 2010 with events among school children and other stake holders. Demonstration of renewable energy facilities available at C-WET to school children and teachers, and a special lecture on "A Few Aspects of Surface Wind and some of its Climatological Features". by Dr. Y.E.A. Raj, Deputy Director General of Meteorology (DDGM), Regional Meteorological Centre (RMC), Chennai marked this year's Global Wind Day.

SAARC Countries delegation (16 members) as part of the training programme organized by US-AID / Indian Wind Energy Association (InWea) visited C-WET on 17th June 2010. Technical team of four members from Gamesa, Spain visited C-WET on 24th June 2010.

C-WET is all set to have International networking and collaborating projects at this moment, some of the highlights are: Indo - Danish collaboration with RISO, Denmark on wind forecasting, and for training in certification with latest IEC standards in vogue, Indo - US energy cooperation with "C-WET-NREL" WIND-MOU exchange visits of Scientists, and the recent Indo - Scotland Workshop on Vision for Offshore Wind Energy in India.

C-WET's Scientists / expertise has been sought after by Indian/International energy developers, as well as several Indian academic Universities/Colleges. C-WET, once again requests your valuable feedbacks on this news letter, for refining ourselves to redefine our role more effectively to "renewable energy that is riding high 'the WIND'".

S. Gomathinayagam
Executive Director

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Developments in R&D UNIT

Small Wind Turbine Type Testing

The unit had undertaken testing of Small Wind Turbine / aero-generator, which is the first of its kind in India, at its test bed at Wind Turbine Test Station (WTTS), Kayathar. The testing activity is done to improve the prospects of the marketability of small wind turbine as well as to boost the confidence level of investors in the rooftop aero-generators.

Analysis was completed based on the measurements acquired from the Testing of the 1 kW & 5 kW models and the reports of Power Performance, Safety & Function and Duration Test were prepared in accordance with the internationally accepted standards of IEC 61400-12-1 & 2.



1kW & 5kW Models at the Test Bed

Further the unit has collected details of over 30 small wind energy system from several manufacturers in India and completed the processing of documentation and reviewed the results under the chairmanship of ED, C-WET and released the first list of empanelment based on the revised MNRE guidelines for SWES systems.

R&D / Experimental Wind Farm

The unit as its part of contribution for the sector's upliftment has been partaking projects that would provide useful value addition to the Wind Turbine Technology. One of them has been to work for the improvement of the functionality & efficiency of different components that come from the wind turbine. As a pursuit of this idea, a 2 MW wind turbine is being installed in WTTS on which R&D works of multi-discipline are being proposed to be carried out and the knowledge base generated would be shared with the stakeholders of the wind sector.

The foundation laying for the 2 MW Experimental Wind Turbine at CWET's Kayathar WTTS facility was completed in February 2010.



Foundation of the 2 MW R&D / Experimental Wind Turbine



R&D Projects

The unit has initiated three projects after the due approval from R&D Council and GC of C-WET, in this year whose end results would enable better understanding the peculiarities of the Indian Electric Grid in context of Wind Turbines Grid tie-up & Power Quality issues that plague them and also result in a mode for the emancipation of rural populace from the perennial problems of power shortages & outages.

- (a) The project "Power Evacuation Studies for Grid Integrated Wind Energy Conversion System" would strive to identify the weak points in the power system & conduct power evacuation studies using load flow analysis and short circuit analysis based on the model generated containing the wind turbines and its grid tie.
- (b) The next project which is also in the same genre and named "Study on Power Quality Issues in Grid Connected Wind Farms and Identification of Remedial Measures" would work to identify the power quality issues faced by a Grid-tied wind turbine & enumerate the remedial measures to overcome the shortcomings.
- (c) The third project is to design and construct an "Everybody's Battery Charger" Savonius Rotor capable of powering a small hamlet's needs and the unique selling point of the work would be to construct the entire configuration from locally available material so that the design can be easily offloaded for rural fabrication & installation.

The recently concluded R&D Council meeting deliberated some of the new proposals involving human resource development as well.

Move on in WRA UNIT

During the period of April to June 2010, 3 new Wind Monitoring Stations in Andaman & Nicobar Islands have been established with 50 m tall masts. Presently, 91 wind-monitoring stations are operational in 20 States and one in Union Territory under various wind monitoring projects funded by the Ministry as well as various entrepreneurs.

Projects on Verification of procedure of wind monitoring have been done for the following sites.

11 sites in Maharashtra for Maharashtra Energy Development Agency, Pune 2) Phalodi in Rajasthan for M/s. Suzlon Energy Limited, Pune 3) Kalmangi, Malavshi, Agaswadi, Akal, Suro Ki Dhani, Tejuva, Gotne, Karvat, Torangallu, Minichery & Want Notiyar for M/s. Suzlon Infrastructure Services Limited, Pune and 4) Theni-1, Theni-2 & Bhud for M/s. ReGen Powertech Pvt. Ltd, Chennai.

WRA unit has also completed the following projects and submitted reports during this period.

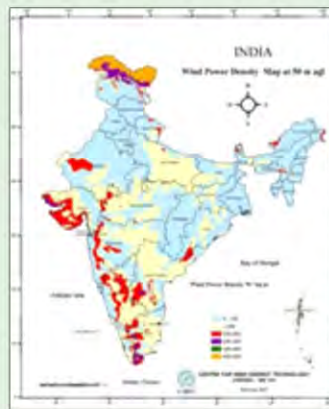
- 1) Site Validation & Generation Estimate for the proposed wind farm projects at Krishna, Kurnool District in Andhra Pradesh, Samana, Jamnagar District in Gujarat, Sipla, Jaisalmer district in Rajasthan and Vagaikulam in Tirunelveli district in Tamil Nadu for M/s. Enercon (India) Ltd., Mumbai.
- 2) Site Validation & Generation Estimate for the proposed wind farm projects at Chakla & Bothe in Maharashtra for M/s. ITC Limited, Bangalore.
- 3) Site Validation & Generation Estimate for the proposed 25 MW wind farm project at Elavanthi, Coimbatore District in Tamilnadu for M/s. Gamesa Wind Turbines Pvt. Ltd., Chennai.
- 4) Technical evaluation reports for the proposed 100 MW wind farm projects in Maharashtra, Madhya Pradesh, Gujarat & Karnataka for M/s. NTPC Limited, New Delhi.
- 5) Wind Resource Assessment Studies at Tuli & Panchgram for M/s. Hindustan Paper Corporation Ltd., Kolkata.

Release of Indian wind Atlas :

Indian Wind Atlas, a data book containing the wind resource availability across the Indian continent for harnessing Wind Energy has been published by C-WET. The Wind Atlas will carry essential data that allows wind farm developers, engineers, investors to learn about the potential generating capacity available in a particular region in India. The book was prepared

by Centre for Wind Energy Technology in association with the Riso DTU, Denmark and the project was completely sponsored by Ministry of New and Renewable Energy (MNRE), Government of India. The Hon'ble Minister, New and Renewable Energy, Govt. of India Dr. Farooq Abdullah expressed his support and released the Indian Wind Atlas on 29th April 2010 at Chennai, and congratulated the scientific team of C-WET.

Shri. Deepak Gupta, I.A.S, Secretary, MNRE, Government of India shared the dias and delivered special address on this event. Dr. G.B. Pant, Chairman of the Technical Committee, Indian Wind Atlas offered felicitations in this important function in his address to the gathering. The Executive Director of C-WET Dr. S. Gomathinayagam welcomed all the guests, invitees & stakeholders and introduced in brief the Indian Wind Atlas. The Unit Chief of the Wind Resource Assessment, Dr. E. Sreevalsan (project leader and one of the authors of the Indian Wind Atlas book) spoke on the occasion about the making of the Wind Atlas and delivered vote of thanks.



Steps forward in TESTING UNIT

The measurement setup for INOX 2000 kW Type Tests was inspected by TUV SUD as per the requirements of the test plan and IEC standards. The instrumentation has been completed and the measurements are expected to start in July, 2010.

The re-certification audit as per the requirements of ISO 9001:2008 was conducted by DNV at Chettikurchi test site here WTTs, Kayathar test site. The unit was recommended for re-certification as per the requirements of ISO 9001:2008.

The unit carried out a detailed market survey along with M/s. BLAEST from Denmark and IWTMA for the establishment of a National facility for Blade Testing in Chennai.

Mr. Carsten Skamris, Managing Director & Mr. Peter Ellegaard, Senior Executive from M/s. BLAEST, Denmark visited C-WET from 08th to 14th June, 2010 in connection with the establishment of a national facility for Wind Turbine Blade Testing.

Marching ahead in S&C UNIT

- Agreement has been signed with M/s. Southern Windfarms Limited (SWL) for renewal of Provisional Type Certificate (PTC) of GWL 225 wind turbine model under category – III as per TAPS-2000 (amended). Upon successful review of documentation, the renewed PTC has been issued to SWL.
- Documentation / information have been obtained from various wind turbine manufacturers for updating the "Revised List of Models and Manufacturers of Wind Turbines" (RLMM). Review of the documentation as per the latest MNRE guidelines dated 08.12.2009 and 08.01.2010 has been completed and updated RLMM main list has been issued on 18.05.2010. Addendum to this list will be issued as per demand on a quarterly basis.
- Agreement has been signed with M/s. RRB Energy Limited (RRBEL) for renewal of Provisional Type Certificate of V39-500 kW with 47m rotor wind turbine model under category – II as per TAPS-2000 (amended). Upon successful review of documentation, the renewed PTC has been issued to RRBEL.
- The certification projects, taken up as per TAPS-2000 (amended) are under progress.
- The continual improvement and maintaining the Quality Management System are ongoing.
- S&C unit has successfully undergone for recertification audit as per ISO 9001:2008 conducted by Det Norske Veritas.

Highlights from ITCS UNIT

Global Wind Day 2010 Celebration

As part of wind energy promoting activities of C-WET, Global Wind Day is celebrated every year on June 15. This year C-WET had celebrated Global Wind Day 2010 with events among school children and other stake holders. Wind energy inter school quiz competition, demonstration of renewable energy facilities available at C-WET to school children & teachers & a special lecture on "A Few Aspects of Surface Wind and some of its Climatological Features". by



Students visiting C-WET facilities

Dr. Y.E.A. Raj, Deputy Director General of Meteorology (DDGM), Regional Meteorological Centre (RMC), Chennai marked this year's Global Wind Day. Winners of an inter-school Energy-Quiz competition were awarded by the Chief Guest of the event.



Students Quiz in progress



Special lecture by Dr. Y. E. A. Raj



Winners receiving the prize

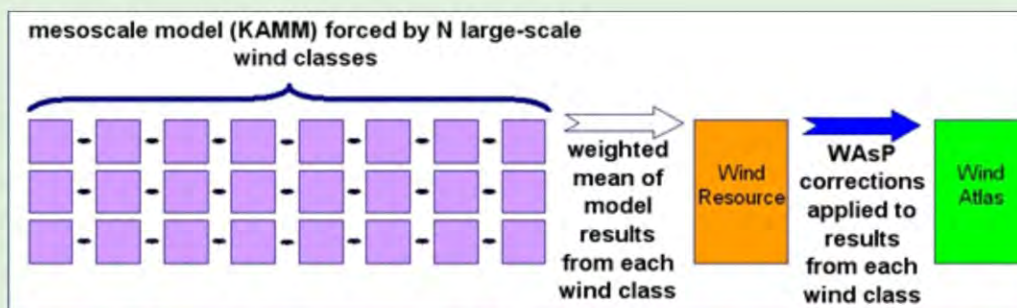
Visitors to the Centre

- SAARC Countries delegation (16 members) as part of the training programme organized by US-AID / Indian Wind Energy Association (InWEA) visited C-WET on 17th June 2010. C-WET activities, services were explained and the facilities available in the campus were shown.
- Technical team of four members from Gamesa, Spain visited C-WET on 24th June 2010. Executive Director, C-WET made a presentation explaining about C-WET activities and services.

INDIAN WIND ATLAS : An Introduction

Dr. E. SREEVALSAN, Scientist & Unit Chief, Wind Resource Assessment, C-WET

Indian Wind Atlas has been published by Centre for Wind Energy Technology (C-WET) recently and it is available for sale. It is a result of combined effort of CWET and Risø DTU National Laboratory for Sustainable Energy, Denmark on the investigation of Indian wind climatology with a specific focus on wind resource assessment for harnessing wind energy. It gives an updated overview of the wind climatological situations of India based on reliable measured wind data and using contemporary numerical mesoscale models. It also seeks to provide an up to date methodology for applying to primary data and results of meso scale model for the purpose of wind resource assessment. Numerical wind atlas methodologies have been used to prepare Indian Wind Atlas and it is devised to solve the issue of insufficient wind measurements. One such methodology is the Karlsruhe Atmospheric Mesoscale Model [KAMM]/Wind Atlas Analysis Application Programme [WAsP] method developed at Risø National Laboratory. In this methodology (Fig. 1) an approach called statistical-dynamical downscaling is used. The basis for the method is that there is a robust relationship between meteorological situations at the large-scale and meteorological situations at the small-scale.

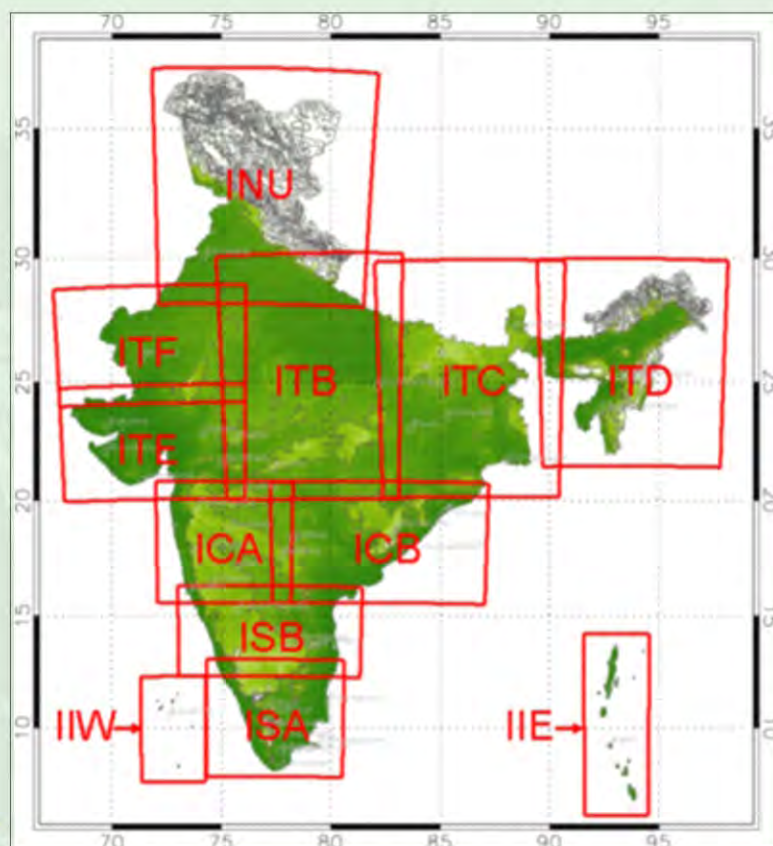


(Fig.1) A schematic diagram showing the KAMM/WAsP numerical wind atlas methodology

Information about the large-scale meteorological situation is freely available from the NCEP/NCAR reanalysis data-set. This data-set has been created by assimilating measurement data from around the globe in a consistent fashion from 1948 to the present day. The data-set is as a long term record of large-scale wind conditions. The NCEP/NCAR data is used to create around 100 different large-scale wind situations, called wind classes that represent the large-scale wind climate.

In order to make these wind classes meaningful at a smaller scale a meso scale model is used to find out how the large-scale wind forcing is modified by regional scale topography. Therefore for each wind class a mesoscale model simulation is performed using the KAMM.

Mesoscale modeling by using KAMM was carried out by Riso-DTU resulting in a generalized wind climate for large domain sizes (12 domains for India) of about 600 km x 600 km (Fig 2) with a resolution of 5 km. Micro-scale modeling for 52 locations was carried out by C-WET using WAsP with real time multi level wind measurements and topographical features as inputs. The domain size is 20 km x 20 km with 1 km resolution.



(Fig. 2) Map of India showing the various modelling domains

The results from the mesoscale model (numerical wind atlas files (.lib)) is made compatible to WASP facilitating prediction of the very local wind climate using the local topography (Fig 3). This will be made available for public at nominal cost. The resolution of the output of microscale models can be made available with 100 m or even lower resolution. These results can be validated with surface wind data measured at nearby locations if required.

The wind map generated through these methodologies, has been verified with measured surface wind data from more than 600 stations and corrected to prepare the final wind power density map at 50 m above ground level (Fig 4.). Weightage is given to topography of the region while preparing the map.

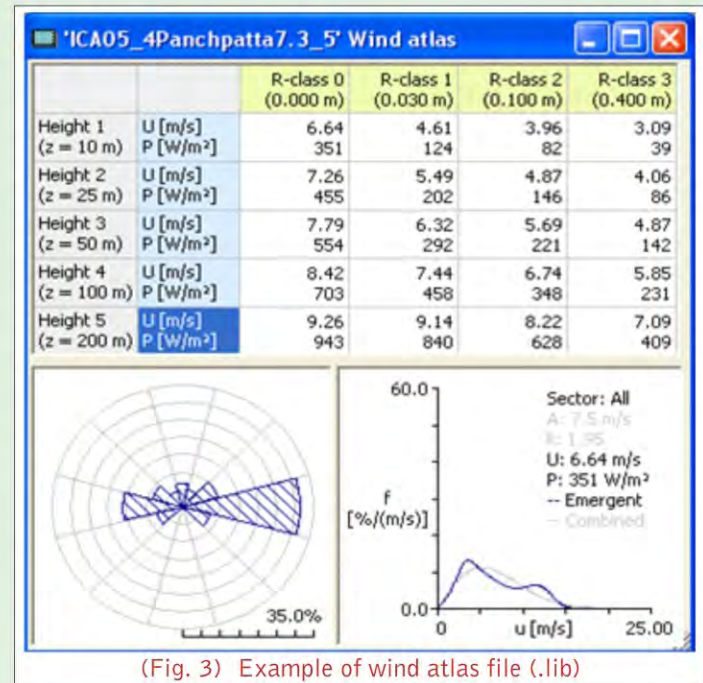
The Indian Wind Atlas has two parts. A book as hard copy for reference and it is supplemented by a digital version of wind atlas for two levels (50 and 80 m) with 5 km resolution. The Indian Wind Atlas book has eight chapters. Chapter 1 introduces the methodology of wind atlas and describes the flow of information and subsequent chapters. Chapter 2 describes the general wind climatology and geography of India. How to make use of Indian Wind Atlas is explained in chapter 3. Indian wind power density map (Fig. 4) is given in this chapter. Based on Indian wind power density map, installable potential of our country is estimated with certain assumption. Chapter 4 focus on meso scale modeling with reference to KAMM and outcome of such model.

Chapter 5 highlights the basics of micro scale modeling and its potential use to further process the results of meso scale models (numerical wind atlas file). Chapter 6 brings out comparative error levels of Wind Atlas results with that of measured wind.

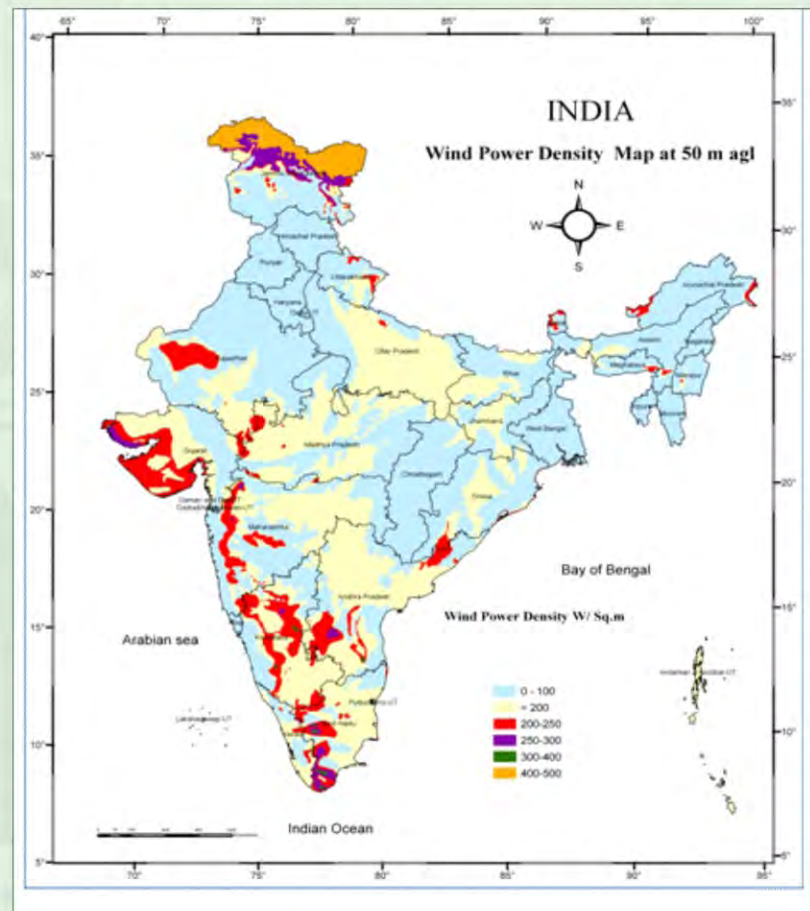
Chapter 7 demonstrates the WASP analysis of measured wind data in terms of techniques and underlying procedures. Chapter 8 provides the review of historical wind monitoring programme in India.

In addition, the details of wind monitoring locations in India, details of basic wind speeds, seismic environment of India and NCEP/NCAR Reanalysis data for the last 30 years are also given in the appendices. In reality, the present Indian Wind Atlas can be used in all three phases (Large area screening, validation with measurements and micrositing) of wind resource assessment according to the available details of inputs for each phase.

(Fig. 4) Wind power Density Map of India.



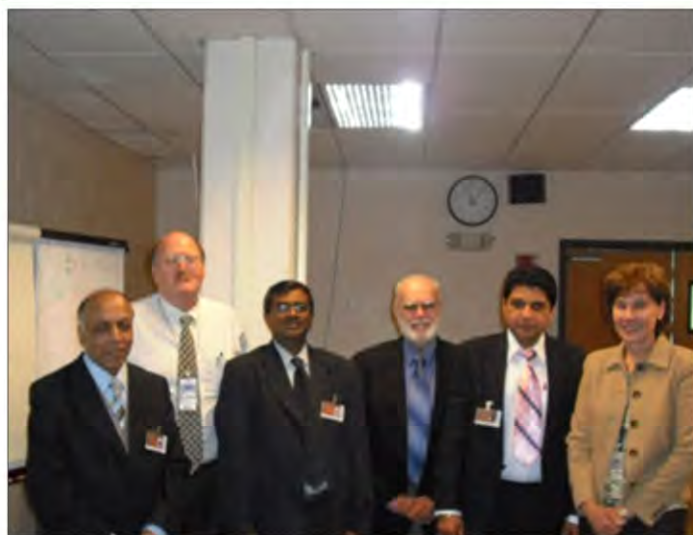
(Fig. 3) Example of wind atlas file (.lib)



International Collaborations of “TEAM C-WET”

Indo - Danish collaboration continues

An MoU has been made operational with Risø, Denmark for development and analysis of techniques of wind forecasting for effective load dispatching and scheduling in India. Another area under discussion with Risø is for training in certification with latest IEC standards in vogue.



MNRE/CWET team at WTTC/NREL

Indo – US Energy Cooperation in action with “C-WET-NREL” WIND-MOU

A MoU signed between C-WET, Chennai and NREL, Colorado has taken shape with exchange of scientists to CWET (Dr. Gunjit Bir, Chief Scientist, WTTC, NREL) and a visit of team of C-WET scientists (Dr. S. Gomathinayagam and Shri. Rajesh Katyal) headed by Joint Secretary, MNRE Shri Hari Kumar to NREL, USA has identified three major areas of wind energy collaboration, the details of the program are being formulated.

Indo - Scotland Workshop on Vision for Offshore Wind Energy in India

MNRE has signed an MoU for renewable energy cooperation with Scotland. After several initial sittings with ETP (Energy Technology Partnership) / SDI (Scotland Developments International) executives / scientists, a team of MNRE (Shri.

Gangesh Upadhyay) / C-WET (Dr. E. Sreevalsan) / TNEB (Shri. Surendran) officials visited Scotland. On return a delegation from Scotland visited C-WET recently and participated in a special workshop. Indo – Scotland Workshop on “VISION FOR OFFSHORE WIND ENERGY IN INDIA” has been conducted at C-WET on 23rd June 2010 on behalf of Ministry of New and Renewable Energy, Government of India. Dr. S. Gomathinayagam welcomed the participants. Padmashri. Dr. Kotta Harinarayana, Shri. Harikumar, Joint Secretary, MNRE and Shri. Mark Dolan, Country Manager, Scottish Development International, India have addressed the participants. More than 60 participants from Indian Wind Industry and various government institutions have participated in the work shop.

The objective of the workshop is to bring all the stakeholders on a single platform to understand the various issues and constraints related to the development of offshore wind energy in global context and to translate the same for Indian conditions. Issues pertaining to clearances from Indian Govt. and local authorities for carrying out offshore wind resource assessment, feasibility study, setting of a demonstration project leading to commercialization etc. have been discussed and debated at the workshop. This workshop was intended to lead towards a clear roadmap for implementation of offshore wind projects in India



FORTHCOMING EVENTS



Event : **2nd Renewable Energy Chennai 2010 Conference**
Date : 25th August 2010,
Venue : The Park, Chennai
Web : www.renewableenergyconference.in/

**Sixth International Training Course on
WIND TURBINE TECHNOLOGY AND APPLICATIONS
for Indian Techno Economic Cooperation (ITEC) & Special
Commonwealth Assistance for Africa Programme (SCAAP)
Countries**

Event : **Sixth International training Course on "Wind
Turbine Technology and Applications"**
Date : 18th October to 3rd November 2010 (Preponed from
8th to 24th February 2011)
Venue : C-WET, Chennai
Web : www.cwet.tn.nic.in & <http://itec.mea.gov.in/>



Event : **Green Energy World Expo 2010**
Date : 14th - 15th - 16th, October, 2010
Venue : Chennai Trade Center, Nandambakkam, Chennai
Web : www.greenenergyworldexpo.in/

DIREC 2010

Delhi International Renewable Energy Conference 2010
27 to 29 October 2010 - India Expo Centre & Mart, Greater Noida
(National Capital Region of Delhi, India)

Event : **The Delhi International Renewable Energy
Conference (DIREC) 2010**
Date : 27th to 29th October
Venue : India Expo Centre – Expo XXI, Greater Noida,
National Capital Region of Delhi
Web : <http://direc2010.gov.in/>



Event : **Global Energy 2010**
Date : 2nd December to 5th December 2010
Venue : Gayathri Vihar, Palace Grounds, Bangalore
Web : www.global-energy2009.com/



Event : **WIND POWER INDIA 2011**
Date : 7th to 9th April 2011
Venue : Chennai Trade Center, Nandambakkam, Chennai
Web : <http://windpowerindia.in/>