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EDITORIAL



With the anxieties glooming in the wind industry on the policy for the 12th plan, the eagerness to go offshore in India is ever increasing. It is needless to say that Government of India has taken this quite serious and is steadily progressing towards the National Policy for offshore wind energy in India. An offshore draft

policy covering various aspects of data collections, marine services and project prospecting, wind resource assessment and project execution and wind power production in offshore region in India has been formulated with a specific goal of not applying any hurdles in way of interested investors in the offshore wind power development in India. Hence the offshore policy has taken care of the existing guidelines practiced by various departments and agencies for maritime research explorations and exploitation of resources in the coastal and maritime zones of India essentially dealing with various security clearances in the Internal waters of states Territorial waters (at 12 nautical miles) in the sea, Contiguous zone (upto 24 nautical miles) and finally the Exclusive Economic Zone (EEZ) (up to 200 nautical miles) from the base line in the coast.

To make the policy an 'ACTIONABLE' one, the policy was derived mostly from the expertise and experience of operation of New Exploration Licensing Policy (NELP) of department of hydro carbon and related rules and regulations governing the operations in the maritime zones of India. The best practices documented by the Crown Estates of United Kingdom provided the needed profile for the policy covering wind resource location, project development and power production, Environmental Impact Assessment (EIA) survey leasing, Offshore site development and measurement of wind power, environmental protection measures and cost recovery through wind power production, wind energy generation sharing by states and the likely taxes, royalties, rentals and duties so that the policy facilitates development without any hindrance through a possible single window approach.

Right now the draft policy formulated will be discussed in a larger forum of offshore steering committee of Ministry of New & Renewable Energy (MNRE) before it is released for use by interested stake holders. C-WET is geared up and making sustained efforts to enable offshore wind power development as early as possible in India.

The Research & Development Unit of C-WET during this period has signed an agreement for Small Wind Turbine (SWT) test with E-Hands covering a wide ranging of turbines supporting from 1.4 kW to 10 kW for testing the data which has been acquired in their health monitoring project with 2 MW R&D wind turbine which is under analysis.

The Wind Resource Assessment Unit of C-WET inspite of reduction in number of projects handled speed up delivery of most of the consultancy projects and verification projects. Apart from maintaining the operating wind mast to the tune of 88 stations, maintenance of some of the 100 m mast in Karnataka and Maharashtra has been taken up. Offshore wind power measurement at Dhanushkodi is being pursued time and again and the Unit also has done research study by doing comparative study between conventional met mast and remote sensing instruments like SODAR & LIDAR at Kayathar.

The Wind Turbine Testing Unit of C-WET has supported continuous measurements at 600 kW Elecon machine.

The Standard & Certification Unit of C-WET has released renewed certificate for RRB and released new RLMM list apart from going through the periodic audit of DNV.

The Information, Training & Commercial Services Unit of C-WET has conducted one National Training course and one International Training Programme during this period. We had eminent and senior speakers such as Shri Moosa Raza, I.A.S., and Shri C.V.Shankar, I.A.S., getting involved in the inauguration and valedictory of these courses to interact with the participants. The unique feature of the 9th International training programme is that the participants were trained practically in the process of manufacturing the small wind turbine as part of the programme. Several college students have visited the institution as part of their industrial visit.

The Solar Radiation Resource Assessment Unit has almost completed one year of measurement in about 47 stations out of 51 stations commissioned last year and the one year data after thorough quality checking is available for sale and use by the industry.

Improvement on O&M techniques is attempted at the Wind Turbine Research Station at Kayathar by installing gear oil cooler system at the nacelle of wind turbine. The results are expected in the next wind season.

The demand for invited lectures and expert lectures from the C-WET staff is ever increasing by the academic institutions and the industry partners. Our Scientists have delivered more than 50 invited lectures in Colleges, Workshops, Symposia and Seminars during this period.

As an institution involved in solving practical issues of stake holders of wind energy technology, henceforth we provide the list of data products and publications which are available for sale at C-WET in this news letter as a regular feature. We also invite advertisement with a nominal tariff since this free online news letter "PAVAN's" circulation has been increasing day by day. You are welcome to make use of this benefit to have better networking of your needs along with C-WET's services.

We welcome critical, constructive comments to improve the 'PAVAN' and to push your business to give green power for all, with Wind and Solar.

S. Gomathinayagam
Executive Director

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Developments in R&D UNIT

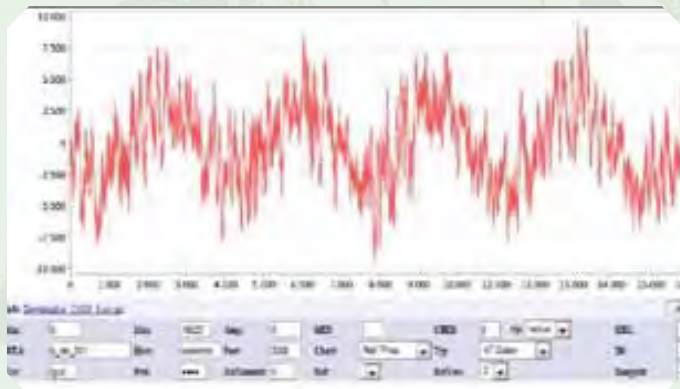
A new test agreement was signed in the month of July between E-Hands and C-WET, R&D Unit for testing their two Small Wind Turbine (SWT) models at WTRS, Kayathar. Presently the number of SWTs currently under test at WTRS stands at nine. The new turbines have been installed in September and the Instrumentation works will be taken up after the commissioning of the turbine by the manufacturer. Now Turbines ranging from 1.4 kW to 10 kW are under empanelment related testing.



SWT Test Agreement signing between C-WET and E-Hands

Health / Condition Monitoring on the 2 MW R&D Experimental Wind Turbine at WTRS facility, Kayathar

2 MW Experimental / Research Wind Turbine at C-WET's, WTRS, Kayathar facility has been procured for the purpose of conducting pioneering & cutting edge research whose results would be disseminated for the benefit of the wind energy stakeholders. As a part of this endeavour the unit has successfully completed the instrumentation for health / condition monitoring for the drive train, blades and the successful commissioning of the drive train condition monitoring happened on 20th July 2012. 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. The blade condition monitoring commissioning is expected to happen shortly.



Amplitude Spectrum of a blade



Frequency Spectrum of 3 blades

Move on in WRA UNIT

During the period from July to September 2012, 14 new wind monitoring stations have been established in two States (12 Nos. in Maharashtra, 2 Nos. in Uttarkhand). Presently, 88 wind monitoring stations are operational in 16 States and 1 Union Territory under various wind monitoring projects funded by the Ministry of New and Renewable Energy as well as various entrepreneurs.

The following consultancy projects have been completed and submitted reports during this period.

- Report on Wind Power Density (WPD) at 50 m AGL at Chakla site in Maharashtra for M/s. Gupta Global Resources Ltd., Nagpur.
- Feasibility Report on Site Assessment for Wind Monitoring Studies at Satara district, Maharashtra for M/s. Kenersys India Private Ltd., Pune.
- Feasibility Report on Site Assessment for Wind Monitoring study in Ennore Port area for M/s. Ennore Port Ltd., Chennai.
- Report on Wind Power Density (WPD) at 50 m AGL at Chakla site in Maharashtra for M/s. Hindustan Zinc Ltd., Rajasthan.
- Report on Wind Power Density (WPD) at 50 m AGL at Chakla site in Maharashtra for M/s. Gangadhar Narsingdas Agrawal (HUF), Goa.
- Report on Verification, Validation and Certification of measured wind data at Damanjodi, Koraput district, Odisha for M/s. National Aluminum Company Ltd., Bhubhaneswar.
- Report on Wind Monitoring in the Ambalapuzha for M/s. Info Park, Kochi.
- Site Validation & Generation, Estimation of proposed (09x1.25 mw) wind farm project at Manikere, Belgaum district, Karnataka for M/s. Suzlon Energy Ltd., Pune.
- Feasibility Report on Site Assessment for Wind Monitoring Studies in Kerala for M/s. NTPC Ltd., Belgaum.

- Report on Wind Monitoring at Puthuvypeen, Ernakulam district, Kerala for M/s. Bharat Petroleum Corporation Ltd., Ernakulam.
- Report on Wind Monitoring at Radhapuram, Tirunelveli for M/s. Surana Industries Ltd., Chennai.
- Site assessment for installing 80 m mast at Shiv Tehsil, Barmer district, Rajasthan for M/s. Rajasthan State Mines & Minerals.
- Site visit for proposed 10 MW wind farm for M/s. Southern Railway on 9th & 10th August 2012.

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

- Manikere, Kanampalli, Devalgaon, Malkapur, Medholi, Bhadthar, Marutla RF2, Mugaon, Tokapalli, Soda Bandhan, Illurondlapalli, Nagewadi, Kavalkuntla, Poladiya, Timancherla, Narayanapuram, Pakharud, Baradvi, Sautada, Haripar, Khangarpur, Bhopalgadh-W, Dhulwad, Dubere, Mutchukota, Jaladurgam, Dhone North, Holagondi, Kosigi, Ganugapenta, Thangaon, Anantgiri, TatepalliThanda, Pulmadi and Tirumalapuram for M/s. Suzlon Energy Ltd, Pune.
- Khandke, Maddalacheruvu -2, Maddalacheruvu and Khanapur for M/s. Enercon (India) Ltd, Bangalore.
- Bhadrapuram-1-RF and Peddakotla for M/s. Helios Infratech Pvt. Ltd., Hyderabad.
- Akal for M/s. RRB Energy Ltd., Chennai.
- Gandhargad and Samangad for M/s. TS Wind Power Developer, Satara.
- Vellappaneri, Amrapur, Pedhewadi and Nigidi for M/s. Gamesa Wind Turbines Pvt. Ltd., Chennai.
- Mendhegiri for M/s. Maharashtra Energy Development Agency, Pune.
- Tummalabilu for M/s. Guttaseema Wind Energy Company Pvt. Ltd., Hyderabad.
- Dasve for M/s. Lavasa Corporation Limited, Mumbai.
- Ralla-Anantapuram for M/s. Renergy Developers Pvt. Ltd., Secunderabad.
- Jura for M/s. Consolidated Energy Consultants Limited, Bhopal.
- Jarugu, Dasimanipalli, Nesevandiapalli and Gollapalli for M/s. Rayalaseema WindEnergy Company Pvt. Ltd., Hyderabad.
- Anumaspalli, Sehabashagudem and Rangapuram for M/s. Belum Wind Infrastructure Pvt. Ltd., Hyderabad.
- Vagarai-4 for M/s. ReGen Power tech. Pvt. Ltd., Chennai.

Wind Monitoring Station Works

- Painting of masts at Dras town, (J & K) as per civil aviation requirement had been completed.
- Inspection of 100 m lattice mast (fabrication work) was carried out at M/s. Shah Energy Inc., Davangere on 10th July 2012 and suggestions / advice were given to the fabricator.
- Inspection of 100 m lattice masts fabricated by M/s. Ramakrishna Iron Works, Maharashtra has been

carried out on 6th & 7th August 2012.

- Field visit to Dhanushkkodi site along with the Manufacturers / Private firms on 1st September 2012 for 100 m offshore wind profile measurement.

R&D projects in progress at WRA Unit

- Shri. K. Boopathi, Scientist & Unit Chief (i/c.), Shri. A. Haribhaskaran, Scientist, Shri. B. Krishnan, Junior Engineer, Shri. T. Sureshkumar, Junior Engineer and Shri. R. Vinothkumar, Technician, WRA have visited Kayathar from 22nd to 24th July 2012 for setting up of remote sensing instruments for Wind Turbine Wake Study & Validation of Triton SODAR, LIDAR with met mast.
- EOI meeting on Design, Fabrication, Transportation, Civil Works and Installation of 100 m tall offshore guyed latticed mast including foundation and operation & Maintenance for tower and guys at Dhanushkodi with the manufacturers / private firms held on 31st August 2012 at C-WET.
- Comparison study between the conventional met mast and remote sensing instruments like SODAR & LIDAR is being carried out in Kayathar

Steps forward in TESTING UNIT

Continuous measurements are under progress for Type Testing of Elecon 600 kW wind turbine of M/s. Elecon Engineering Company Ltd. at Chettikurchi site, Kovilpatti Taluk, Tuticorin district.



Elecon 600 kW Blade, Site & Factory Instrumentation

An agreement was signed between C-WET and M/s. Jyoti Ltd. for Type Testing of WIND JYOTI – SE 850 – 56 / 70 kW wind turbine and measurements are expected to start during the windy season of 2013.

A proposal for "Forecasting of Wind Power" under the Indo-Spanish joint call has been prepared and forwarded to MNRE for approval.

An indigenous data acquisition equipment development is under progress and expected to be completed in December 2012.

An Inter Laboratory Comparison (ILC) with 18 accredited laboratories under the NREL leadership has been initiated for Power Curve Measurements as per the requirements of IEC 61400-12-1. The participation in the ILC is within the group IEC TC 88 Certification Advisory Committee Test Laboratory Subgroup Meeting.

The external audit as per the requirements of ISO 9001:2008 was successfully completed during 3rd – 4th September 2012 with 4 note worthy points for the unit by DNV, Chennai.



Height Safety And Rescue Training - Theoretical & Practical

"Safety & Rescue Training" by M/s. Safecorp Safety Services Pvt. Ltd. was held on 22nd and 23rd August, 2012 at WTTS, Kayathar.

Marching ahead in S&C UNIT

Agreement has been signed with M/s. RRB Energy Limited for renewal of Certificate of Pawan Shakthi – 600 kW wind turbine model under Category-II as per TAPS-2000 (amended). Carried out review / verification of documentation in connection with renewal of Certificate of Pawan Shakthi – 600 kW wind turbine model. Based on the review / verification, renewal of Certificate has been completed and renewed Certificate has been issued to M/s. RRB Energy limited.



Issuing renewed Certificate to M/s. RRB Energy Limited

Documentation / information have been obtained from various wind turbine manufacturers in connection with Revised List of Models and Manufacturers of wind turbines (RLMM) Main List. Review / verification of documentation / information have been completed. Carried out verification of adequacy of manufacturing facilities in connection with RLMM. Organized RLMM Committee meeting. RLMM MAIN LIST, finalized by RLMM Committee has been issued on 31st July 2012.

Completed various preparatory activities in connection with implementation of the MNRE guidelines dated 22nd May 2012 for installation of prototype wind turbine models in India. Review / Verification of documentation / information submitted by various Indian Wind Turbine manufacturers in this regard are under progress.

S&C Unit has undergone the periodic audit conducted by M/s. Det Norske Veritas for Quality Management System of Certification services as per ISO 9001:2008 and it has been successfully recommended for continuation. The continual improvement and maintaining the Quality Management System are ongoing.

Co-ordination with members of the Working Group formulated by C-WET in connection with standards related activities are ongoing.

Highlights from ITCS UNIT

Twelfth National Training Course

ITCS Unit had successfully organized its 12th National Training Course on "Wind Energy Technology" specially for Students during 18th to 20th July 2011 with an objective to transfer knowledge and needed special skills to the students who are keen to focus their career on renewable energy. The course was inaugurated by Shri. D. V. Giri, Secretary General, Indian Wind Turbine Manufacturers Association (IWTMA).



Shri. D.V.Giri Inaugurating the course

The programme has provided comprehensive knowledge right from Wind Resource Assessment to Installation & Commissioning of wind farms along with technical and financial

challenges. 40 students participated in the course coming from various educational institutions and they are all Doctorates, Post Graduates, Under Graduates and PG Diploma holders. The course was highly appreciated by the participants for its content and the way of organization.



Participants in front of the C-WET campus

The lectures were delivered by C-WET Scientists, National Industry and Academic experts. Shri. C.V. Sankar, I.A.S., Principal Secretary to Government, Environment & Forest, Tamil Nadu was the Chief Guest for the valedictory function and distributed the course certificate to the participants.



Shri. C.V.Sankar, I.A.S distributing the course certificate

Ninth International Training Course

ITCS unit had successfully organized the Ninth International Training course on "Wind Turbine Technology and Applications" during 5th – 27th September 2012 to address all aspects of Wind Power starting from wind resource assessment to installation, operation and maintenance aspects of wind farms along with financial analysis and CDM benefits. This is a special training course for Indian Technical and Economic Co-operation (ITEC) and Special Commonwealth Assistance for Africa Programme (SCAAP) partner Countries organized by Centre for Wind Energy Technology, Chennai, India under the ITEC / SCAAP programme of Ministry of External Affairs (MEA), Government of India with the support of Ministry of New and Renewable Energy (MNRE), Government of India. The course was attended by 31 participants from 22 countries (Afghanistan, Ethiopia, Ghana, Iraq, Kazakhstan, Kenya, Lesotho, Malaysia, Mongolia, Myanmar, Niger, Nigeria, Peru, Philippines, South Africa, Sri Lanka, Sudan, Syria, Thailand, Tanzania, Ukraine and Vietnam)

The training course was inaugurated by Shri. Mooza Raza I.A.S, Padma Bhushan Awardee, Member, RFD-ATF, New Delhi, Former Chief Secretary to Government of J&K & Secretary to Government of India.



Shri. Mooza Raza I.A.S inaugurating the function

The course content for the training was very comprehensive syllabus and the lectures of the course delivered by eminent scientists, engineers and other wind energy professionals with years of experience drawn from C-WET, wind turbine industries and academic institutions. The 23 days programme included classroom lectures, field & factory visits and practical training sessions to provide complete knowledge transfer to the participants. As part of the training course, the practical training with Wind Resource Assessment, Instrumentation, Testing & R&D equipments was arranged apart from the factory visits to M/s. ReGen Powertech at Tada where they had a chance of listening from the industry experts who is actually in the process of making wind turbines and visiting the manufacturing facilities.



Participants during the factory visit

To provide hands on experience, the participants have been taken to M/s MinVayu facilities at Auroville where all the participants had a chance of manufacturing Small Wind Turbine themselves after getting theoretical training of how to manufacturing the Small Wind Turbine with the local materials at low cost.

The participant were 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 and they also had opportunity of visiting wind farms in and around Kanyakumari, where wind turbines are installed in large numbers like coconut trees.



Participants in the process of manufacturing Small Wind Turbine

The course structure and organization of training was highly appreciated by the participants. The participants were very much satisfied by the quality of lectures and hospitality they found in India and the feedback from the participants reflected the need for more number of training programme like this frequently.



Dr. M. Sekar, Dean CEG, Anna University distributing the certificate

Shri. Dr. M. Sekar, Dean - CEG, Anna University, Chennai was the chief guest for the valedictory function and distributed the course certificate to the all the participants.

Visitors to the Campus

During the period from July to September 2012, the following visits were coordinated by ITCS Unit. Shri P. Kanagavel, Scientist & Unit Chief (i/c) has made a presentation on wind energy and it's status along with C-WET's activities & services during the visits and the campus facilities were also showcased.

- 20 students from ME Power Electronics Department of SKR Engineering College, Chennai on 29th August 2012.
- 19 Students from ME Power Systems of Anna University, Chennai on 10th August 2012.
- 51 Students from Electrical and Electronics Engineering of SRM University, Chennai on 08th August 2012.
- 40 students from Aalim Muhammed Salegh College of Engineering, Chennai on 6th August 2012.
- 54 students of Electrical and Electronics Engineering Department from Hindustan University on 26th July 2012.
- 19 students of M.E. Power Electronics from Velammal

Engineering College on 26th July 2012.

- 52 students of Electrical and Electronics Engineering Department from Hindustan University on 24th July 2012.
- 42 Students of EEE Department from Sai Ram Engineering College visited on 12th July 2012.
- 18 Participants from National Institute for Technical Teachers Training visited on 4th July 2012.

Advances in SRRA

Third Technical Committee Meeting for phase-II SRRA project was held under the Chairmanship of Executive Director, C-WET on 13th June 2012 at C-WET, Chennai. A new Data Centre for SRRA with dedicated server and system for performing Quality Assessment of SRRA data was established on 20th July 2012 at C-WET. Floated Global Tender for "Supply, installation, commissioning and maintenance of measuring instruments for Solar Radiation and other meteorological parameters at 60 locations and advance measurements including Sky Radiometers at 4 location" under phase-II of SRRA project. A meeting on the National Solar Data Policy was held at New Delhi on 13th July 2012 under the Chairmanship of Joint Secretary, MNRE. The Solar Data Sharing and Accessibility Policy (SDSAP-2012) was uploaded on C-WET website on 17th August 2012. The SRRA data selling was initiated by selling the first set of data on 31st August 2012. A meeting with Adviser, MNRE, (Solar) and SEC, Gurgaon officials was held at C-WET during 13th - 14th August 2012 in regard to the setting up of calibration facilities at SEC. Site selection for Phase-II SRRA project was carried out in Kerala and partially in Maharashtra during the period July- August, 2012.

Windy Acts at WTRS UNIT

Gear Oil Cooler System unit along with control panel was fabricated and successfully installed in one of the 200 kW MICON wind turbine to reduce the gear oil temp while in operation as demonstration purpose.



Installation of Gear Oil Cooling System at Nacelle

High speed pinion shaft bearing end cap of a 200 kW MICON wind turbine replaced at C-WET's Research Wind Farm at Kayathar.

Conversion of battery operated vehicle into solar powered vehicle at WTRS, Kayathar is under progress.

Technical Visits to WTRS, Kayathar

- 10 officials from WRA unit of Suzlon Energy Ltd, Bangalore on 11th July 2012.
- 60 students and 4 staffs members from Ultra College of Engineering & Technology for Women, Madurai on 3rd August 2012.
- 56 students and 4 staffs members from Mohamed Sathak Engineering College, Kilakarai on 9th August 2012.
- 110 students and 10 staff members from Maamallam Institute of Technology, Vadamangalam, Chennai on 7th September 2012.
- 58 students and 2 staff members from V. V. College of Engineering, Tisaiyanvilai, Kanyakumari district on 11th September 2012.
- 60 students and 4 staff members from Sethu Institute of Technology, Kariapattai, Virudhunagar district on 14th September 2012.

Invited lecture delivered / meeting attended by C-WET Scientists in external forums

Dr.S.Gomathinayagam, Executive Director

- R&D Project review on "Everybody's Battery Charger" RMK College, Gummidipoondi on 21st September 2012.
- Chaired Inaugural Session and gave inaugural address for two days workshop on "Emerging Trends in Renewable Energy" at Dr. MGR University, Chennai on 20th September 2012.
- Attended Stakeholder Consultation on India GHG protocol for Local Governments under project "Integrating Urban Climate Guidelines through Clean Technologies (RE & EE) at the State and City level to build Sustainable Low Carbon Cities", Tamil Nadu funded by the British High Commission (BHC), India at Raintree Hotel at Alwarpet, Chennai on 17th September 2012.
- Invited Lecture on "Wind Energy conversion technology change in power generation" at SERC campus for M.Tech (Renewable Energy) students of Academy of Scientific and Innovative Research (AcSIR) on 14th September 2012.
- Sub-Committee for preparation of Draft Policy Guidelines for development of offshore wind energy at MNRE, Newdelhi on 13th September 2012.
- Meeting on Wind Energy update -Wind development forum India at Le Meridien Hotel, New Delhi and chaired the session "Venturing offshore-taking the first steps" on 7th September 2012.
- Inaugural function of Association of Aeronautical Engineers at MIT, Chrompet on 31st August 2012.

- Guest of Honor & delivered key note address at National Level Conference "Recent Trends in Power Electronics for Renewable Energy Systems" of Dhanalakshmi College of Engineering, Tambaram, Chennai on 31st August 2012.
- Chaired as session on behalf of C-WET for Webinar at British High Commission on 30th August 2012.
- Invited Lecture on "Grid Connected Wind Energy Conversion System-Current Trends" at SKR Engineering College, Poonamalle, Chennai on 27th August 2012.
- Chief Guest for the Valedictory function for IEEE Tech Work shop on "Smart Grid" at Anna University, Alumni Centre on 26th August 2012.
- Attended IEEE-PES two days workshop on "Advances in Distributed Generation, Microgrid, Net-metering and Renewable Integration at Bangalore and Chaired a session on "Storage Technologies on 24th August 2012.
- Doctoral Committee Meeting to consider Ph.D. Synopsis Meeting at MIT, Department of Aerospace on 17th August 2012.
- Chief Guest at Praudyotsav 12 at Prathyuksha Engineering College, Poonamallee, Thiruvallur on 14th August 2012.
- R&D Conclave on New and Renewable Energy-prospects for cross cutting technology during 9th to 10th August 2012.
- Offshore sub-committee meeting conducted by TANGEDCO, on 8th August 2012.
- Attended half day Government stake holder's workshop for discussing the draft project report on "Action plan for comprehensive renewable development in Tamilnadu on 6th August 2012.
- Attended Round Table on "Wind Power Programme" conducted by MNRE on 1st August 2012.
- Project Monitoring Committee meeting of Technology Development Board (TDB/DST) on "Wind Turbine Development" at Vadodara on 27th July 2012.
- Parliamentary Standing Committee on Energy (2011-2012) Examination of subject "International cooperation in New & Renewable Energy Sector" on 23rd July 2012.
- Industrial Exemption Committee Meeting on "Land Reforms under Sec 37-A Tamil Nadu" conducted by GoTN on 19th July 2012.
- Meeting on "Environment Control- preparation of Tamil Nadu State Action Plan on Climate Change" conducted by GoTN/Energy on 12th July 2012.
- Chief Guest for the Annual General Meeting and Investors Meet at Coimbatore conducted by IWPA on 11th July 2012.
- Chief Guest at Arunai College of Engineering, Tiruvannamalai for inauguration of EEE Department Association on 7th July 2012.
- Invited guest for Industrial Meet at L&T construction on "Wind and Solar" at Manappakam on 6th July 2012.

**Research & Development****Rajesh Katyal**, Scientist & Unit Chief

- Lecture on "Wind Resource Potential and Way Forward for Offshore Development in India" at PSGR Krishnammal College for Women, Coimbatore on 30th August 2012.

Wind Resource Assessment**K.Boopathi**, Scientist & Unit Chief (i/c)

- Participated in the Pre-bid meeting at M/s. BEL, Bangalore on 9th August 2012.
- Meeting with Nowcasting Scientists / Engineers at M/s. NAL, Bangalore on 10th August 2012 and had a discussion with the team members for carrying out Wind Power forecasting.
- Meeting at Kayathar on 4th July 2012 and had discussion for purchase of land for R&D project at Kayathar.

Wind Turbine Testing**S.A.Mathew**, Scientist & Unit Chief

- Chief Guest for "National Conference Embedded Systems and Advanced Communication Systems, ESAACS" for the ECE & EEE students organized by Department of ECE & EEE Association of Ecentriconz of Vel Tech High Tech Dr. Rangarajan, Dr. Sakunthala Engineering College, Chennai on 9th August, 2012.

M.Anwar Ali, Scientist

- Invited guest lecture on "Wind Energy" at Sathyabama University, Chennai on 16th August 2012 for the students of Mechanical & Production department.
- Sectoral Working Group on "Energy Efficiency, Renewable Energy & Solar Mission" for the preparation of draft report on State Action Plan on Climate change (SAPCC) held under the chairmanship of the Principal Secretary, Energy organized by Tamilnadu Energy Development (TEDA) held on 27th July 2012 at Chennai.

Information, Training & Commercial Services**P.Kanagavel**, Scientist & Unit Chief (i/c)

- "Wind Energy: A solution for sustainable future" in the National level Seminar on Renewable Energy Xplorer organised by N.P.R College Engineering & Technology, Natham on 27th August 2012.
- Meeting on Environment Control-preparation of Tamil Nadu State Action Plan on Climate Change conducted by GoTN/Energy on 12th July 2012.

Solar Radiation Resource Assessment**Dr.G.Giridhar**, Scientist & Unit Chief

- Chief Guest for "Inauguration of R&D Centre" at Prathyusha Institute of Technology & Management, Chennai on 29th August 2012.
- Lecture on the activities of SRRA and participated the workshop on "Advances in distributed generation: Micro-Grid, Net-metering & Renewable Integration" organized by IEEE PES India Council Chapter, Bangalore during 24th - 25th August 2012.
- Chief Guest in the inauguration of "Professional Chapters and Association of Department of Electrical and Electronics Engineering" at Prathyusha Institute of Technology and Management, Chennai on 7th August 2012.
- Chief Guest in the "National Level Workshop on Solar Energy" at Rajalakshmi Engineering College, Chennai on 2nd August, 2012.
- Chief Guest in 'Recent Development in Soft Energy Technology and ENERGY EXPO-2012' held at Tirunelveli on 26th July, 2012.

Wind Turbine Research Station, Kayatar**Shri.A. Mohammed Hussain**, Scientist & Unit Chief

- Lecture on "Off-Shore Projects in India" during the visit of German Delegates along with NTPC officials to Alleppey District, Kerala for the feasibility of Off-Shore Wind Project in Alleppey District, Kerala on 25th June 2012.

The following C-WET staff delivered lecture(s) in the 12th National Training course on "Wind Energy Technology" specially organized for students during 18th – 20th July 2012

No	Title	Speakers
1	- Wind Energy Conversion Tech. and Power Generation: Introduction - Wind Turbine Tower Concept	Dr. S. Gomathinayagam Executive Director
2	- Design and Layout of Wind farms - Wind Turbine Components	K. Boopathi Scientist & Unit Chief (i/c), WRA
3	Design Aspects of Drive Train	J.C.David Solomon , Scientist, R&D
4	Wind Electric Generators & Types	M. Anwar Ali , Scientist, WTT
5	Design requirements of Control and Protection System	S. Arulselvan , Asst. Engineer, S&C
6	- Wind Turbine Foundation Concept - Small Wind Turbines and hybrid systems	Rajesh Katyal , Scientist & Unit Chief, R&D
7	Grid Integration of Wind Turbines	Deepa Kurup , Scientist, R&D
8	Type Certification of Wind Turbines	A. Senthil Kumar , Scientist & Unit Chief, S&C
9	Wind Turbine Testing	S. A. Mathew , Scientist & Unit Chief, WTT
10	Indian Government Policies	Mohammed Hussain , Scientist & Unit Chief, WTRS
11	Role of C-WET in Wind Energy Development	P. Kanagavel , Scientist & Unit Chief, ITCS

The following C-WET staff delivered lecture(s) in the 9th International Training course on “Wind Turbine Technology & Applications” organised for ITEC/SCAAP Countries during 5th – 27th September 2012

No	Title	Speakers
1	- Wind Energy Conversion Technology and Power Generation - Wind Turbine Tower Concept	Dr. S. Gomathinayagam Executive Director
2	- Role of C-WET in Wind Energy Development - Environmental Aspects of Wind Turbine Technology - Wind Energy Development in India	P. Kanagavel Scientist & Unit Chief (i/c.), ITCS
3	- Wind Resource Assessment Techniques - Wind Resource Assessment by using Remote Sensing Instruments - Wind Turbine Components	K. Boopathi Scientist & Unit Chief (i/c), WRA
4	- Siting Guidelines for Wind Measurements - Monitoring Station Instrumentation and Installation	A. Hari Bhaskaran Scientist, WRA
5	Measurement Parameters and Data Analysis	G. Arivukkodi , Asst. Engineer, WRA
6	Drive Train Concepts	David Solomon , Scientist, R&D
7	Design aspects of Wind Turbine Gearbox	N. Raj Kumar , Scientist, S&C
8	Wind Electric Generators & Types	A. G. Rangaraj , Scientist, S&C
9	- Wind Turbine Foundation - Small Wind Turbine Testing and Hybrid Systems	Rajesh Katyal Scientist & Unit Chief, R&D
10	Design requirements of Control and Protection System	S. Arulselvan , Asst. Engineer, S&C
11	Grid Integration of Wind Turbine	Deepa Kurup , Scientist, R&D
12	- Wind Turbine Testing & Measurement Techniques - Power Curve Measurements	S. A. Mathew Scientist & Unit Chief, WTT
13	Instrumentation for Wind Turbine Testing	M. Saravanan , Scientist, WTT
14	Safety and Function Testing	M. Anvar Ali , Scientist, WTT
15	Type Certification of Wind Turbine and Overview of Design Requirements as per IEC 61400 - 1	A. Senthil Kumar Scientist & Unit Chief, S&C
16	Wind - Solar Hybrid Systems	R. Sasi Kumar , Scientist, SRRA
17	- Indian Government Policies, Schemes and Legal Frameworks - Overview of Testing facilities of WTRS	Mohammed Hussain Scientist & Unit Chief, WTRS
Practical Session at WRA Lab, C-WET and WTRS, Kayathar		
18	Wind Resource Assessment Lab (Instruments)	G. Arivukkodi , Assistant Engineer T. Sureshkumar , Junior Engineer
19	Wind Resource Assessment Lab (Remote Sensing & WAsP)	B. Krishnan , Junior Engineer R. Vinodkumar , Technician
20	Instrumentation - Sensor wise at WTTS, Kayathar	A.R. Hassan Ali , Assistant Engineer Y. Pankiyaraj , Assistant Engineer M. Karuppuchamy , Assistant Engineer S. Paramasivam , Junior Engineer

Smart Grid and Wind Power in India : a way forward

A compilation of short excerpts from the Special cover stories on “ SMART GRID : Key to sustainable energy future” of Energy Blitz, Vol-I (VI) June-July 2012 and from Webresources

Conventional power system operations (Fig.1) are well known to be uni-directional. We understand that the electricity generated in a centralized hydro/thermal/nuclear power stations flows in one direction from the generation point to the consumer through the transmission and distribution systems. With more and more societal/environmental issues with these projects, apart from availability and supply of coal in time has caused serious set backs in the power for all in India. The new thinking is pollution free green power from renewable (Fig.2) rather in decentralized mode. This would also avoid the costly and huge transmission losses in the current Indian scenario. Wind and solar are the key and major renewables all over the world with wind being more affordable as of now in several states of the country. Both these resources have a common uncertainty that is the power from these inexhaustible sources are infirm at times of need. Higher penetration of the wind power in any grid system needs a spinning reserve to sustain the grid power in quality and in quantity. The management of distributed generation (DG) and load management with renewable with either storage interface or spinning reserve has become essential.

The smart grid technology facilitates that by a fabulous fusion of energy generation / distribution / consumption technologies, Information technology, and telecommunication technologies. SMART GRID thus has a two-way communication in power system operation as against a conventional one way power flow. Editor of Energy Blitz Menon, M.R. (2012) says that SMART GRID generally refers to a class in technology, and defines : “A smart grid is digitally enabled electrical grid that gathers, distributes, and acts on information about the behaviour of all participants (suppliers and consumers) in order to improve the efficiency, importance, reliability, economics, and sustainability of electrical services”. In essence it monitors, generation, transmission, distribution, consumption, and even electrical appliances in real time. The pillars of the “SMART GRID” are optimization of (i) Generation (ii) Transmission, (iii) Demand side management, (iv) Distribution and (v) Asset management.

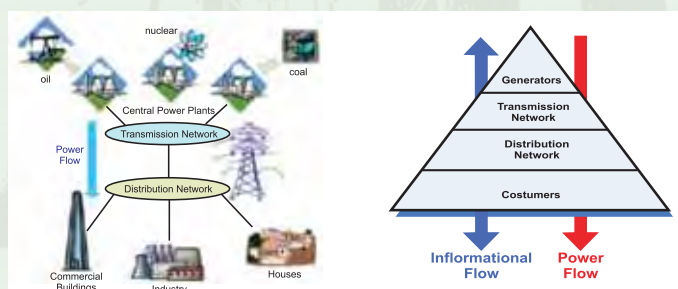


Fig.1 Conventional Power System Management

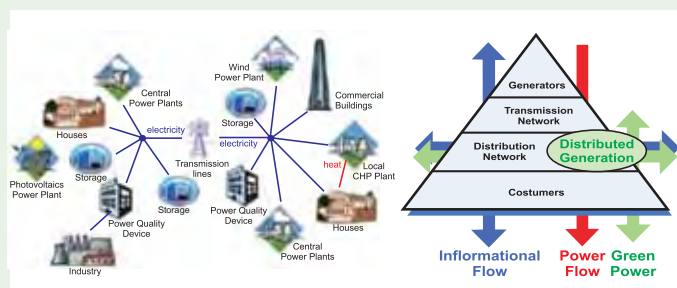


Fig.2 Distributed Generation with SMART GRID Management

Optimisation of Generation

In the case of fossil fuels, and fuels which can be stored can be used as per the long term demand by well planned supply chain and application of appropriate technology. Owing to the need for pollution free green power, several renewable have become available as options some of the fuels are storable while others such as wind and solar have to be harnessed as and when they are available at specific sites where they are economically exploitable. To manage such infirm power being fed into the grid, load based generation with logical hybrid generation schemes should be used by optimizing the generation as per the demand. Optimization of generation from renewables and their grid integration or offgrid / micro grid application needs SMART GRID Management to switch on and off the right type of electricity generation source.

SMART GRID also enables management of energy storage systems and their optimized use in the renewable energy generation systems, specially with wind and solar which are abundantly available in most places of the country during several hours to the whole season depending on the location.

“Distributed generation is going to be the order of the day, which will be cost effective only if locally available renewable are used in a microgrid and hence will be part of the smart grid system. Solar energy is available in India every where but with some limitations; Wind, mini / micro hydro, geothermal, biomass can be a good supplement to solar. This combined with a storage device, battery or super capacitors, and a back-up diesel generator makes Microgrids highly reliable and cheap”, says Ramanathan Menon of Energy Blitz.

Optimisation of Transmission

The desired features for optimization of transmission system involve, Phasor Measurement Technique, Wide Area Measurement (WAM), flexible AC Transmission System (FACTS), Adaptive Islanding, Self healing Grids, Probabilistic and Dynamic Stability Assessment, Distributed and autonomous Control. The potential advantages of such rigorous power

management units are time synchronized sub-second data, Dynamic behavior observing, Directly provides the phase angles (State Estimation to State Measurement), Improve post disturbance assessment, High data rates and low latency due to computation. In the case of onshore transmission systems, the digital control of various components such as transformers, power conversions and renewable power interfacing with grid. If a sensor network provides data on temperature of conductor, power flow details at a central computer the smart grid will make power system operation and maintenance cost effective, efficient and speedier.

The transmission lines with huge line losses can be identified and low-loss systems such as high temperature superconductors, HVDC (High Voltage Direct Current) can be used to minimize losses. In the later case a AC-DC conversion and de-conversion systems are required as part of the system. Smart transmission would have data flow parallel to the power line to record and manage every event.

Optimisation of Demand side Management

Demand side management (load management with localized generation), is the key element in smart grid where the information flows bidirectional from generator-end to consumer-end and vice-versa. Techniques of isolation of AC/DC microgrids should be part of smart grid in distribution. Depending on the demand for more power prioritized generation of electricity from various resources can be initiated, which would need in real time the demanded load on the grid. Such an information is facilitated by an embedded network of sensors and smart meters, through a feed back network so that different generators of electricity exactly know when to sequence the switching circuits using what resource for how much duration. A good design of demand side management will give rise to an economic or optimum design of the managed distribution systems. Jeff Meyers observes Implementing advanced distribution management systems (advanced DMS) to optimize the network of GRID, for voltage and VARs, using a technique labeled Distribution System Demand Response (DSDR) to reduce peak load demand.

Optimisation of Distribution

This module of the smart grid is where the first distributed generation from most renewables like wind, solar, microhydel, ...etc., get integrated in the grid if permitted. Distributed generation and distributed usage saves against energy losses. Digitisation and automatization of the distribution network is facilitated by smart grid components such as smart meters, advanced metering interface (AMI), smart sensors, smart substations, smart power plants, and smart controls for distribution network management. In his comprehensive paper on Smart Transmission Grids (STG), Dr. Ashok Kumar concludes "With a common digitized plat form, the smart transmission Grids will enable increased flexibility in control, operation and expansion; allow for embedded intelligence, essentially foster the resilience and sustainability of the grids; and eventually benefit the customers with lower costs, improved services and increased

convenience through three interactive smart components: smart control centers, smart transmission networks and smart substations."

Power and electricity are essentially becoming more and more dear due to the ever increasing demand. In India, peak power deficit is almost 10 to 15% in most states, and this can be obviated by digital control and billing of power consumption in different times of the day. When a consumer consumes power during peak period he/she can be charged more than normal times. This time of the day (TOD) costing of power is possible if the consumption and metering interface has a time stamp on the measurement of power use. This is facilitated by smart grid with intelligence of the networked information on power flow and its consumption for various applications.

Optimisation of Asset management

What are the assets of the power system?; the equipment used for generation, transmission, quality control, testing, substations, advanced metering interfaces, remote digital communication and control, prognostic fault diagnosis, digital and geo-physical identification of faults and solutions without "emergency brake-down inspection", energy conscious appliances, intelligent choice of resources in distributed generation using local renewables, AC/DC micro grid components, in the case of smart building energy management systems the sensors, data acquisition, analysis and processing systems, need instant attention with system generated solutions for direct field implementation.

Smart Grid would be the proven technology for deployment to manage all the interlinked assets of the complete power system from generation to consumer based on the central control of data flow not only from generator to consumer but also from consumer feed back to the generators. The future smart grid is shown in a broad sense is clearly depicted in the slide presentation from IIT, Jodhpur, given as Fig.3



Fig.3 A Futuristic description of smart grid in terms of all components (IIT, Jodhpur: Web resource)



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