pavan

नीवे NIWE
ISO 9001 : 2008

ISSUE - 46 July - September 2015 | Newsletter of NATIONAL INSTITUTE OF WIND ENERGY, Chennai | http://niwe.res.in

EDITORIAL

With Global cumulative offshore installed capacity exceeding 10 GW as of now, the Levalised Cost Of Energy (LCOE) in the offshore is about € 140 per MWh. The sustained efforts of consortium of offshore wind developers in Europe has estimated the LCOE to fall down to € 90 per MWh by 2030, expectations.

At the moment, Germany has also declared the new concept of SCOE (Societies Cost Of Energy) in which they have very clearly highlighted the benefits of low carbon technology, and the 'higher scale up' that is possible in the offshore and the significant advantages of green power and carbon emission reduction, mitigating climate change effects with these developments in the rest of the World. India has announced an offshore wind energy policy through a Government of India notification in September, 2015.

While the advantages of the offshore has been talked in several previous editorial columns of this Newsletter, it is appropriate to recall now at this juncture, the real need of going offshore in India. The land acquisition for renewable Energy projects by competing technologies such as Solar has kept the wind developers, however matured technology providers they are, in the back foot. Moreover, with an excellent manufacturing capability of wind power equipment and the proven track record of EPC contractors working offshore in the areas of Oil exploration, production and refining projects. India stands in good stead to launch its first offshore wind power project as early as possible.

At this juncture, NIWE/MNRE acknowledges the support of International agencies such as Scottish Development International, British High Commission, European Union, in their dedicated efforts to address the various issues of first offshore wind development project in India. NIWE complementing the International efforts has also started measuring offshore wind since October, 2013 at North of Gulf of Mannar, near Dhanuskodi Island. The data is highly promising for development of offshore wind power projects off the costal Tamil Nadu. Parallely by NIWE's association with FOWIND project of EU consortium, is in the process of measurement of offshore wind in Gulf of Khambhat area using LiDAR.

This quarter also marks an important event which was haunting the minds of wind power stakeholders in India. The question of "What is the true wind power potential of India?" The puzzle is out on the first week of September when NIWE released its online GIS based wind atlas for the public by the Hon'ble Minister, Shri Piyush Goyal at a function at New Delhi. The Atlas has one of the finest resolution of 500 m by 500 m giving wind resource data at a click of mouse. As per the notified policy, NIWE as a nodal agency nominated by MNRE, the nodal Ministry for facilitating offshore wind power project development in India is fully geared to meet the challenges by setting up a special division to cater to the various needs of offshore wind development in India. NIWE has been assisting in technical support to MNRE in monitoring the small wind and hybrid research projects operational in various Institutions in India. The photonic system developed indigenously for real time remote monitoring of wind and other air parameters has been demonstrated at our Kayathar site and will be developed into a commercially usable prototype very soon.

NIWE provides wind power forecasting services to the SLDC of Tamil Nadu with continuous improvement in quality and in accuracy. The launch of Indian Wind Atlas projects gross total potential in India of 302 GW at 100 m level which means a great opportunity for the established wind project developers with 2nd largest manufacturing base in India.

Three type testing assignments and two power curves measurements are in progress during this quarter.

A renewal project for Pavan Shakti 600 kW has been taken up and completed. A single window due diligence on behalf of Government of India of wind turbine manufacturers has been actively reviewing over 50 wind turbine models and released the main list (RLMM) on 28-09-2015.

The Human Resource Development along with National and International participants has been carried out by NIWE and several site visits to Kayathar's Wind Turbine Research Station have been coordinated to upscale the Research infrastructure at NIWE. Several support facilities are being established such as Video Conferencing, 380 kVA diesel Genset, 30 kW SPV power plant, and a new face lift at the main entrance.

The newly formed division Knowledge Sharing Management has been coordinating, the Technology Think Tank (TTT) series of lectures and several active speakers have contributed knowledge sharing under this umbrella.

NIWE Scientists including the Solar Radiation Resource Assessment mission mode team have been contributing to the capacity building and consequently a consultancy development in all renewable energy areas including wind, solar, wind-solar hybrids.

As usual several invited lectures, standards committee representation and review meetings, post graduate thesis guidance and of course publications, marks this quarter a progressive quarter for NIWE.

NIWE has been awarded the New Education Leadership Award by Vijayavani in Bengaluru on 12th September, 2015. A serious thinking for the Industry sponsored research to be carried out at NIWE for India's skill development and "Make in India" is already in focus. We invite critical comments and suggestions from the elite wind & solar energy industry.

Dr. S. Gomathinayagam, Director General

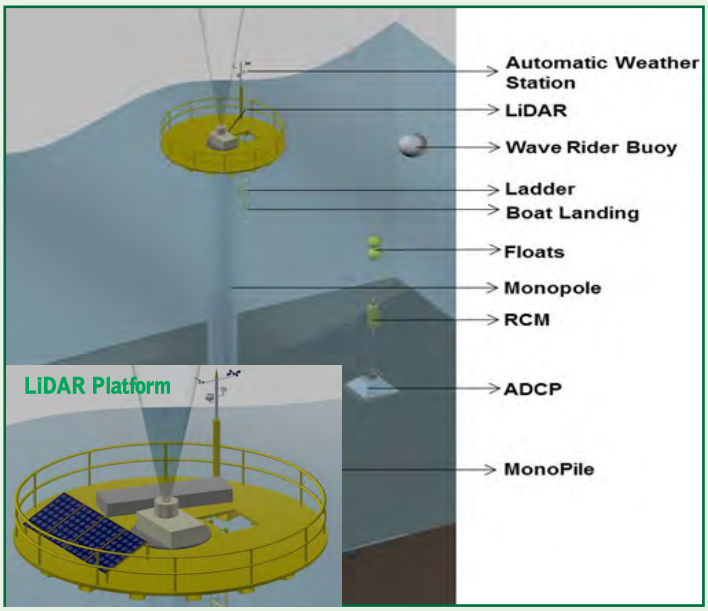
Contents

Editorial Board

Offshore, Small Wind Hybrid System & Industrial Business

Establishment of Offshore LiDAR at Gulf of Khambhat

NIWE is in the process of establishing a platform sub-structure for assessing the offshore wind by LiDAR measurement at Gulf of Khambhat, off Gujarat coast. This is an outcome of the FOWIND project of EU, aimed at developing a roadmap for offshore wind development in India. The design and technical specifications for the offshore platform has been finalized in association with National Institute of Ocean Technology, Chennai.



Sub-structure for mounting LiDAR

Research and development in Small Wind and Hybrid Systems

The Ministry of New and Renewable Energy (MNRE) has identified thrust areas in small wind energy systems for R&D. Under this, the following proposals from academic institutions / manufacturers have been identified for funding and NIWE is providing all technical support to MNRE in coordinating the execution of these projects:

A Novel Fused Converter For Wind-PV Hybrid System to Power Rural Telephony

The project being carried out in association with SSN College of Engineering proposes to develop a novel single stage cost effective, simple and efficient fused converter topology for application to wind-solar hybrid systems to power telecom towers. A parallel power transfer scheme from the renewable sources will help in improvement of efficiency of the system. Optimization of circuit components for telecom applications will also be investigated.

Development and Installation of Micro Thruster Augmented Wind Power Generator using a 200 kW Wind Turbine at NIWE research facility, Kayathar

This project has been proposed by VIT, Vellore. It aims at the development of 200 kW micro Thruster augmented wind power plant. The project uses the concept of using a micro air jet stream at the tip of blade of wind turbine to achieve operation at lower wind speed for better efficiency and getting higher capacity utilization factors (CUF).

Three different size Thruster fabricated - Thruster test rig setup

Investigations on Small Capacity Wind Turbine with Compressed Air Energy Storage System

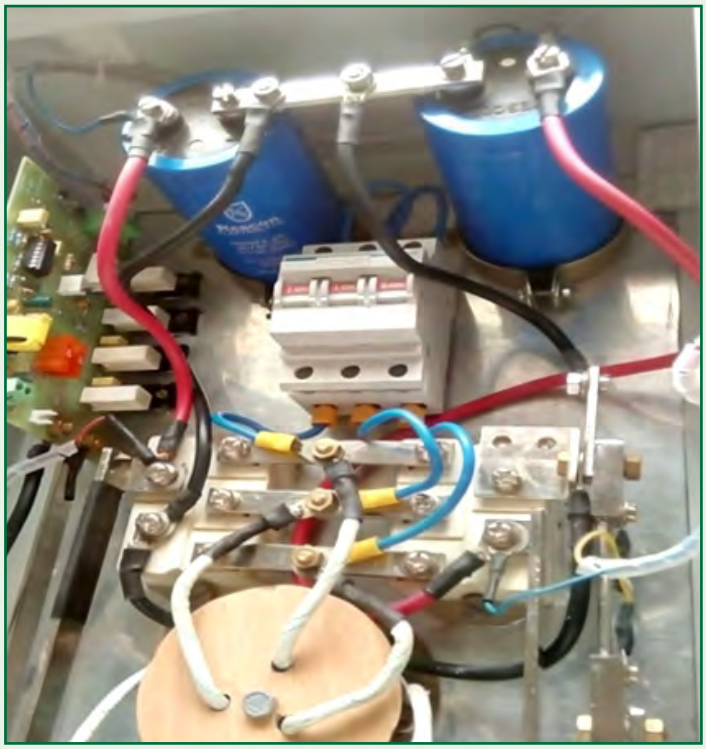
The project in association with Institute of Energy Studies, Anna University, Chennai aims at using a compressed air energy storage with a wind turbine. Thermal Energy Storage (TES) system will be developed and integrated with the wind turbine system to improve the overall system performance.

PMC members visit to review the mid-term project progress at Anna University

Experiments will also be conducted to evaluate the performance with charging and discharging to determine the turnaround efficiency.

Design, Development of 3 kW Small Wind Aero-generator and Wind Charge Controller

This project being undertaken by a small wind turbine manufacturer, M/s. Spitzen Energy Solutions (India) Private



Wind Charge Controller

Limited, Pune aims at design and development of 3 kW rating aero generator based on permanent magnet technology. The objective is to design aero generator, which will be suitable for operation (higher generation) at low wind speeds. Also a small wind charge controller will be developed for operation in harsh environmental conditions (temperature, humidity, etc.) The controller shall have inbuilt energy meter to display all important parameters like current, battery voltage, units generation (kWh) and instantaneous generation etc.

Design and Development of 1 kW Hybrid Vertical Axis Wind Turbine System for Low Wind Speed Regimes

The project in association with Hindustan Institute of Technology and Science aims at designing and developing Hybrid Vertical Axis Wind turbine for low rated wind speeds (4-5 m/s) using Magnetic levitation technology. This type of hybrid vertical axis turbine is easy to carry anywhere. These turbines can be used to generate their own power for their daily energy requirement.

Hybrid Energy Management using Cyber-Physical Controller for Real Time Energy Management System for Micro Grid Application

The project is being carried out by Hindustan Institute of Technology and Science. The objective is the development of a new real time Energy Management System (EMS) to improve energy utilization rate of solar and wind energy. The real time EMS of the micro grid will be achieved by design and implementation of cyber-physical controller based on improved minority game algorithm.

Testing of Small Wind Turbines

Presently testing of 5 Nos. of small wind turbine ranging from 650 W to 15 kW is underway. Out of these, one Small Vertical Axis Wind Turbine of 15 kW (grid-connected) first of its kind by the Unit is undertaken for testing.

One-day inception workshop

Coordinated a one-day inception workshop on "EU-Indo Joint R&D platform to support and promote offshore wind energy technology in the country" held on 18th September 2015 at Conference Hall, NIWE, Chennai. The workshop was organized by FOWIND, GWEC and NIWE as the knowledge partner.

Wind Resource Assessment

During the period of July to September 2015, 1 wind monitoring station in Madhya Pradesh has been closed down. Presently, 106 wind-monitoring stations are operational in 14 States and 1 Union Territory under various wind monitoring projects funded by MNRE as well as various entrepreneurs.

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

- Verification of procedure of wind monitoring for 24 sites
- Technical Due Diligence for the proposed 176 MW wind farm
- Technical Evaluation for the proposed 50 MW wind farm
- Energy Estimation for the proposed 150 MW wind farm
- Pre-feasibility study for 1 site
- Indicative Technical wind potential at 80 m level
- Detailed Project Report for 80 MW wind farm

R&D Projects progress in WRA

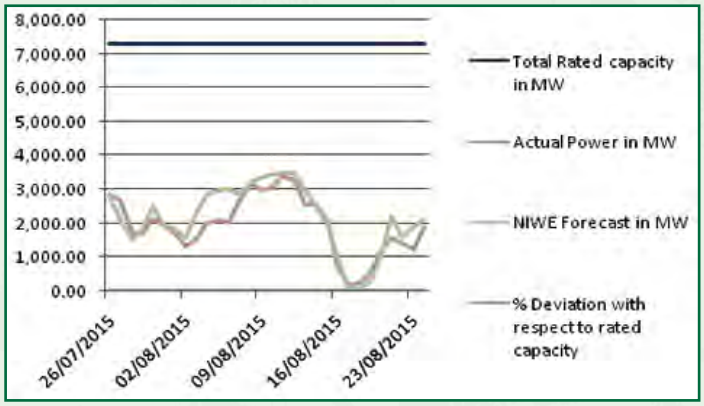
Design and Development of a Photonic System for real time remote monitoring of Wind and other Air Parameters

NIWE in collaboration with GVP-SIRC is involving in the design of an indigenous photonics system for real time remote monitoring of wind and other meteorological

parameters. The concept of technology has been detailed through discussions and a preliminary validation study has also been performed at Kayathar, Tamil Nadu with NIWE's 120 m meteorological mast. As part of second mile stone, M/s. G.V.P. Scientific and Industrial Research Centre has submitted a report on SAMIRA "Vertical Wind Profiling System Automated Collimation, Translation and Data Acquisition". At present, GVP has designed and developed a prototype of the system. The field evaluation of the prototype has been in progress, and the system was demonstrated during 26th to 28th August 2015 at NIWE.

Wind Power forecasting services

- 104 Substation Historical data / Power curve has been processed and used to train the forecasting system.
- ABT Meters for aggregated wind energy were fixed in the 67 substations and linked the real time generation data to our NIWE server.
- Automation system has been created to process the real time generation data for all the 67 substations and the same were used to train the forecasting system.
- Based on the processed Historical generation data and real time generation data training the forecasting model is in progress in 30 substations.
- Continuous co-ordination is being carried out with IWPA, TANGEDCO and other stake holders to get historical / real time generation data for executing the project successfully.
- Automation system has been created to refine the forecast results based on real time generation data.
- Another automation system has been created to send the refined forecast results to Energy Secretary-Tamil Nadu, CE-NCES, CMD- TANGEDCO, Director-Operation, CE-operation & Chairman of IWPA via mail.
- Error Analysis of NIWE- Vortex wind power forecasting is in progress for the past 1 month.

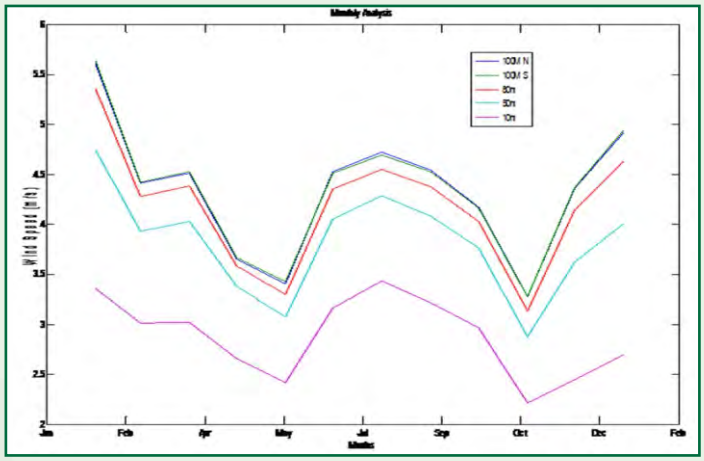


Error Analysis

Estimation and Validation of WPP at 100 m Level in 7 States of India

Established 75 number (10 in Andhra Pradesh, 12 in Gujarat, 12 in Rajasthan, 13 in Karnataka, 8 in Maharashtra, 8 in Madhya Pradesh and 12 in Tamil Nadu) of Wind monitoring stations under the project 'Estimation & Validation of Wind Power Potential at 100 m level in 7 States of India and the needed one year continuous data acquisition is nearing completion in mast sites.

- One year continuous data acquisition from 57 number of WMS (9 in Andhra Pradesh, 8 in Gujarat, 3 in Madhya Pradesh, 4 in Maharashtra, 12 Karnataka, 10 Rajasthan and 11 Tamil Nadu) and two year continuous data from 11 number of WMS has been completed successfully.
- Continuously monitoring and receiving real time wind data from 70 stations in 7 States.
- Monthly Data Analysis, Verification and preparation of Interim reports are in progress.



Monthly Wind data analysis

Wind Resource Assessment Studies

- After the draft, the final report for M/s. THDC has been sent.
- Final report of the first year data for M/s. NSL has been sent.
- Preparation of draft report of 3 sites in Kerala for M/s. ANERT is in progress.
- Interim report for Gangavaram Port Trust has been sent.
- Site inspection and rectification work at Gangavaram port trust has been carried out.
- Monthly Data analysis for Kudgi site for M/s. NTPC has been carried out.
- Monthly Data analysis for Ennore Port has been carried out.

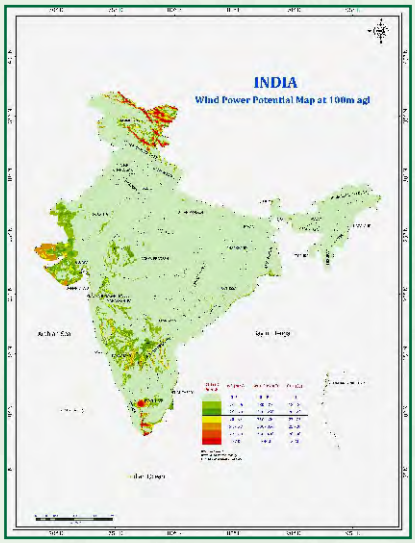
- Monthly Chip processing & data analysis for Gangavaram port trust has been carried out.

Other Programmes

- K. Boopathi, Head of WRA attended Meeting Energy Secretary, Maharashtra in connection with Wind Power Development in the State of Maharashtra during 6th & 7th August 2015.
- Meeting on REMC project & Wind Power Forecasting has been convened at NIWE on 20th August 2015.
- Technical Committee Meeting to evaluate & finalize the revised Wind Potential Map of India has been convened at NIWE on 25th August 2015.
- Work related to Urban Wind Monitoring in Chennai, Coimbatore, Tirunelveli & Vellore region in coordination with educational institution / private / public sector companies has been initiated.
- Successfully undergone the Second periodic audit conducted as per 9001:2008.
- WRA Head / Scientist / Engineers had participated in the Wind Atlas launch programme at India Habitat Centre, New Delhi on 2nd September 2015.
- Mr. A. Haribhaskaran, Scientist, WRA carried out site visit at Kandla Port area for M/s.Kandla Port Trust, Gujarat during 14th & 15th September 2015.

Launch of Wind Atlas at 100 m level

Under the direction of MNRE, NIWE has assessed India's wind power potential at 100 m hub height with scientific rigor and based on authentic latest available data-sets of wind as well as land geologically spread across India. This information is essential for the Policy makers, Private players, Government Agencies and other stakeholders of the industry to move towards achieving the ambitious goal of 60,000 MW of wind power by 2022 as envisaged by the government. NIWE (formerly C-WET) had already performed the potential estimation study corroborating meso-scale derived wind maps and micro-scale measurements and released Indian Wind Atlas at 50 m and indicative values at 80 m hub heights with 5 km resolution in April 2010 in collaboration with RISO-DTU, Denmark.



Launch of Wind Atlas at 100 m level

NIWE has chosen advanced modeling techniques and revisited this study as per the guidance and directives of MNRE with realistic and practical assumptions and estimated the wind power potential at 100 m height as 302 GW. The present potential assessment has been carried out at a very high (10 times finer than 5 km) spatial resolution of 500 m, using the advanced meso-micro coupled numerical wind flow model, and with the corroboration of almost 1300 actual measurements spread all over India, which can be stated as first of its kind. In addition, the study has been performed with actual land availability estimation using NRSC 56 m resolution Land Use Land Cover (LULC) Data (AWiFS) 1:250 K scale and with consideration of 6 MW / Sq.Km. Land features which are not suitable for wind farming have been excluded from the potential map with appropriate buffer/set-off. In addition, other developments such as roads, railways, Protected Areas, Airports, etc., have been excluded. Land

NIWE Officials with Hon'ble Secretary Mr. Upendra Tripadi and Hon'ble Joint Secretary Ms. Varsha Joshi

area with elevation more than 1500 m and slope more than 20 degree have also been excluded. The suitable land features have been grouped into 3 ranks (Rank I: Wasteland, Rank II: Cultivable Land and Rank III: Protected Forest Land) and highest availability of 80 % in Rank I, 30 % in Rank II and 5 % in Rank III have been assumed for the potential estimation. The map has been prepared in Capacity Utilization Factor (% CUF) scale and the land having CUF more than 20 % has only been considered for potential estimation.

State	Rank I	Rank II	Rank III	Total (MW)
Andhaman & Nicobar	4	3	1	8
Andhra Pradesh	22525	20538	1165	44229
Chhattisgarh	3	57	16	77
Goa	0	0	1	1
Gujarat	52288	32038	106	84431
Karnataka	15202	39803	852	55857
Kerala	333	1103	264	1700
Lakshadweep	3	3	1	8
Madhya Pradesh	2216	8259	9	10484
Maharashtra	31155	13747	492	45394
Odisha	1666	1267	160	3093
Puducherry	69	79	4	153
Rajasthan	15415	3343	13	18770
Tamil Nadu	11251	22153	395	33800
Telangana	887	3348	9	4244
West Bengal	0	2	0	2
Total in MW	153020	145743	3489	302251
Total in GW	153	146	3	302

Preparation of web enabled online GIS based Wind Atlas at 100 m level has been completed successfully and the same was launched on 2nd September 2015 at Habitat Centre, New Delhi under the chairmanship of Hon'ble Minister of State with Independent Charge for Power, Coal, New and Renewable Energy and and Secretary, MNRE at the online platform, for the public.

Wind Turbine Testing

- Type Testing of XYRON 1000 kW wind turbine at Richadewda, Ratlam District, Madhya Pradesh of M/s. Xyron Technologies Limited. The measurements are expected to start during last week of September 2015.
- Type Testing of GVSL 1700 kW wind turbine at Kampaneari Pudhukudi Village, Tenkasi Taluk, Tirunelveli District, Tamilnadu of M/s. Garuda Vaayu Shakti Limited. The measurements are in progress.
- Power Curve Measurement of INOX 2000 kW wind turbine at Rojmal, Rajkot District, Gujarat of M/s. Inox Wind Limited. The measurements are completed.
- Type Testing of INOX 2000 kW wind turbine at Kidi village, Babra Taluk, Amreli District, Gujarat of M/s. Inox Wind Limited. The instrumentation work at the site is on-going.
- Power Curve Measurement of Regen 1500 kW wind turbine at Vagarai Village, Dindigul District, Tamil Nadu near Dharapuram of M/s. Regen Powertech Private Limited. The trial measurements are in progress. The final measurements are expected to start during 2nd week of September 2015.
- Successfully undergone the Second periodic audit conducted as per ISO 9001:2008.

NATIONAL TRAINING

19th National Training Course on

"WIND ENERGY TECHNOLOGY"

during 14th - 18th March 2016

Detailed information is made available in NIWE website (http://niwe.res.in)

Standards and Certification

- An agreement has already been signed with M/s. RRB Energy Limited to take up the project on renewal of Certificate of "Pawan Shakthi – 600 kW" wind turbine model. Review / Verification of documentation in connection with renewal of Certificate of "Pawan Shakthi – 600 kW" wind turbine model as per TAPS - 2000 (amended) has been completed. Based on the review / verification, renewed certificate has been issued to M/s. RRB Energy Limited.

Issuing renewed Certificate to M/s. RRB Energy Limited

- Review / Verification of documentation provided by various wind turbine manufacturers for more than 50 wind turbine models in connection with Revised List of Models and Manufacturers of wind turbines (RLMM) – Main List has been carried out.
- Organized the RLMM committee meeting and issued RLMM Main List dated 28.09.2015 to various stakeholders including wind turbine manufacturers, State Electricity Boards, TRANSCOS and State Nodal agencies etc., The RLMM Main List dated 28.09.2015 is also hosted in NIWE website.
- S&C Engineer along with MNRE official carried out the joint field inspection at M/s. SKF Technologies (India) Private Limited, Ahmedabad and Gujarat.
- Review / Verification of documentation of a prototype wind turbine model received from the wind turbine manufacturer as per MNRE guidelines is ongoing.
- Review of draft Indian standards viz, "Wind turbines – Part 12-1: Power performance measurements of electricity producing wind turbines" and "Wind turbines – Part 12-2: Power performance of electricity - producing wind turbines based on nacelle anemometry" is under progress.
- Mr. A. Senthil Kumar, Director & Head, S&C participated 6th meeting of Wind Turbines Sectional Committee, ET (42) of BIS held on 19th August 2015 at BIS, New Delhi.
- The continual improvement and maintaining the quality management system are ongoing.
- Successfully undergone the Second periodic audit conducted as per ISO 9001:2008.
- Co-ordination works with Bureau of Indian Standards (BIS) and members of working group on standards in connection with preparation of draft Indian Standards on wind turbines related activities are ongoing.

Wind Turbine Research Station

For the windy season 2015, all the 9 number of 200 kW MICON Wind Electric Generators were put in for un-interrupted operation, after successfully completion of Operation & Maintenance works and the power generated is fed into the Grid during the windy season 2015.

The following visits were coordinated and showcased the Small & Large Wind Turbine Testing, R&D and WRA facilities:

- 23 delegates from System Operators of Load Despatch Centres as part of NIWE's Special Training Course on "Wind Energy Technology" on 17th July 2015.
- 34 students and 2 staff from V. V. College of Engineering Thesayanvilai, Tirunelveli, Tamil Nadu on 23rd July 2015.
- 51 students and 4 staff from Thiru Ramakrishna Nallammai Polytechnic College, Dharapuram Taluk, Erode District, Tamil Nadu on 6th August 2015.
- 18 International participants as part of NIWE's 16th International Training Course on "Wind Turbine Technology and Applications" on 3rd September 2015.

Information, Training and Customized Services

16th International Training Course (28 days)

Successfully conducted the 28 days 16th International Training Course on "Wind Turbine Technology and Applications" during 12th August to 8th September 2015 addressing all aspects of Wind Power starting from introduction to wind and its technology, wind resource assessment, installation, operation and maintenance aspects of wind farms along with financial analysis and CDM benefits. This is a special training course for ITEC / SCAAP partner Countries sponsored by the Ministry of External Affairs (MEA), Government of India under ITEC / SCAAP programme. The course was attended by 18 Participants from 12 countries (Afghanistan, Gambia, Guyana, Laos, Malawi, Mongolia, Myanmar, Nigeria, Sudan, Tanzania, Uganda and Zimbabwe)

The training was inaugurated by Mr. R. Virendra, Deputy Director General, National Productivity Council, Chennai.

During the 28 days of training, 46 classroom lectures were handled, which was handed by NIWE scientists and external experts, Wind Turbine Manufacturers, Wind Farm and Developers, Consultants, Academicians, Utility and IPP to provide complete knowledge transfer, arranged practical training at NIWE Laboratories, study visit to (I) Auroville for small wind turbine manufacturing workshop cum hands on training (ii) M/s. Regen Powertech Factory at Tada for large wind turbine manufacturing process (iii) Structural Engineering Research Centre (SERC), Taramani for Wind Tunnel facilities (iv) State Load Despatch Centre, Chennai for power load management (v) WTTS / WTRS, Kayathar for large and small wind turbine testing facility (vi) Wind Farms in and around Kanyakumari for knowledge on various working wind turbines (vii) M/s. RS WindTech to know the Operation and Maintenance processes and (viii) M/s. Appollo Engineering Works to know the Controllers and transfers.

Chief Guest releasing the Course Material

Chief Guest distributing the Course Certificate


Participants duirng Wind Farm Visit


Glimpses of practical session during Small wind turbine manufacturing training

Mr. T. Sankaralingam, former Chairman and Managing Director, National Thermal Power Corporation (NTPC) was the Chief Guest for the Valedictory Function and distributed the course certificates to the all the participants.

Special Training Course (for SLDCs)

Successfully conducted the Special Training Course on "Wind Energy Technology" for System Operators of Load Dispatch Centres (LDCs) during 13th – 18th July 2015 to address all aspects of Wind Power starting from introduction to wind and its technology, wind resource assessment, installation, operation and maintenance aspects of wind farms along with financial analysis. The course was attended by 22 participants from System Operators of Load Dispatch Centres (LDCs) and one participant from Sethu Institute of Technology, Virudhunagar. The course was inaugurated by Er. J. Rexline Terese, Chief Engineer (P&C), Tamil Nadu Electricity Board.

Chief Guest addressing the gathering

During the 6 days of training, 21 classroom lectures were handled and visit to Wind Turbine Test Station and Wind Turbine Research Station at Kayathar and working wind farms in and around Kayathar and Kanyakumari were arranged for practical exposure. Mr. A. Mohamed Hussain, Deputy Director General and Head, WTRS, NIWE

Participants infront of Suzlon

Chief Guest distributing the Course Certificate

distributed the Course Certificates to all the participants at valedictory function arranged at Kanyakumari.

NIWE-IWTMA Knowledge Forum

For the benefit of wind industry, NIWE in association with IWTMA conducts NIWE-IWTMA Knowledge Forum on latest developments. In this series, 11th forum has been conducted on "Recent Trends in Wind Turbine Testing, Validation and Certification" by UL DEWI in NIWE Conference Hall on 29th July 2015. More than 60 participants from wind turbine manufacturing company and research institutions attended the forum.

Student visits

During the period from August – September 2015, the following visits were coordinated with presentations and explanations on wind energy and it's status along with NIWE's activities & services. The campus renewable energy facilities were also explained / showcased in detail.

- 20 polytechnical teachers as part of training course conducted by NITTR, Taramani, Chennai on 15th July 2015.
- 75 students from The Pupil Saveetha Eco School, Chennai on 1st September 2015.
- 37 students from Prince Shri Venkateshwara Arts & Science College, Chennai on 15th September 2015.
- 58 students from Loyola - ICAM College of Engineering and Technology on 30th September 2015.

Students visiting the Wind-Solar Diesel Hybrid System

Issue-46, July - September 2015 pavan Newsletter of NATIONAL INSTITUTE OF WIND ENERGY, Chennai

Visitor at NIWE

Mr. Upendra Tripathy, IAS, Chairman, Governing Council, NIWE and Secretary, MNRE, Government of India & Ms. Varsha Joshi, IAS, Joint Secretary, MNRE had visited NIWE on 31st July 2015 and given inspiring address to all NIWE Staff members. The Director General explained all the activities and services of NIWE apart from showcasing the campus facilities.

Hindi Fortnight 2015

Hindi Fortnight 2015 was celebrated in NIWE during 14th to 28th September 2015. Competitions were conducted for Hindi Speaking and Non-Hindi speaking officials and Outsourcing Staff of NIWE. Mr. Jawaahar Laal Sharma, Consultant (OL) read out the Hindi Day-2015 message of Mr. Rajanath Singh Ji, Honorable Union Minister of Home Affairs, Government of India which was delivered on 14th September, 2015. 153 participants took part in the competitions. Valedictory function was conducted on 28th October 2015, the prizes were distributed to the winners by Dr. S. Gomathinayagam, Director General, NIWE.

Engineering Services Division

- **Video conferencing:** The order has been accepted by the supplier on 13th July 2015 and inspected conference room for layout design. The display hall has been selected for the establishment of Video Conferencing system and the work has been started from 31st July 2015. The old structures have been removed and the false ceiling, painting work, placement of table along with the Cassette AC installation work have been completed in August 2015. The installation of Video Conferencing system work is in progress.
- **380 kVA and 62.5 kVA Diesel Generator:** Installation of 62.5kVA Diesel Generator has been installed and commissioned on 3rd August 2015. The 380 kVA Diesel Generator foundation has been completed on 14th August 2015 and other works are in progress.
- **30 kW SPV power plant:** A committee has been formed for procurement of 30 kW SPV power plant at the roof Top. The work order has been issued and the structural work has been started from 27th July 2015. Structural work has been completed on 15th August 2015 and other works are in progress.
- **CPWD Civil works:** Proposal has been submitted to CPWD for (i) construction of Entrance Gate and front side Compound wall, work has been started from 30th January 2015, Cost estimate has been received and the initial payment has been paid to CPWD for (ii) existing compound wall to the extent for the 10 feet height at NIWE, work has been started from 17th May 2015 and completed on 16th September 2015. Estimate has been received for construction of new compound wall and 33 % payment has been released.
- **Construction of platform and cabin for Renewable Energy Laboratory:** Approval has been received on 12th June 2015 and the platform has been completed on 5th July 2015 and entire work completed on 3rd September 2015.
- **LAN networking :** Agreement has been signed with M/s. Wayzon InfoTech for the execution of LAN restructuring work. The replacement of all the CAT – 5E cables to CAT – 6A in the ground floor cabins have been completed. Completion of remaining major locations and the minor lines and testing of the network links. Documentation, configuration and testing and other works are in progress.
- **Water proofing coverage work:** Water proofing coverage for Auditor & Account section cabins work order has been issued and work is completed on 26th August 2015 and also Water proofing coverage for SRRA cabin & SRRA server cabin work order issued on 9th September 2015 and work completed on 15th September 2015.
- **Replacement of damaged tiles near conference hall:** Replacement of damaged tiles work (around 820 sqft.) near conference hall and the work was completed on 10th August 2015.
- **Installation of Digi – Scroller :** The Digi Scroller has been successfully installed on 3rd July 2015 at the reception hall.
- **Supply and Installation of solar panel for Battery Operated Vehicle:** The solar panel with charge controller are required for the battery operated vehicle to charge through solar power and awaiting for execution of work.

Knowledge Sharing and Management

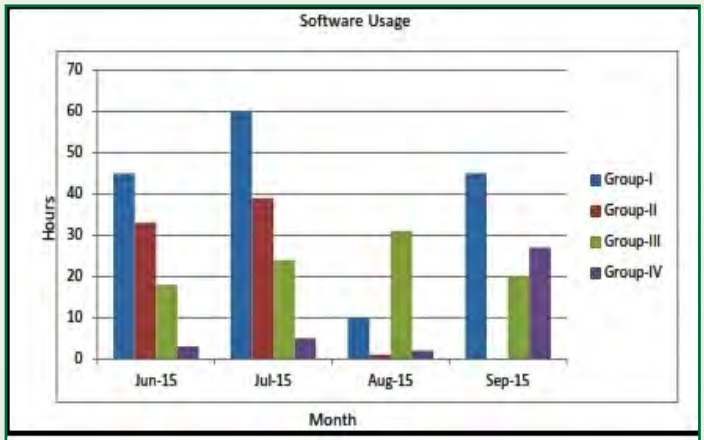
The knowledge sharing culture as a part of the NIWE initiative is not an isolated knowledge management programme but is an effective collaboration and communication which spans across the whole institute. Every employee has a sphere of influence along with their own individual knowledge and the Technology Think Tank (TTT) has provided the platform for ideation and cerebration inside NIWE.

TTT session in progress

Resource personnel from Wind Resource Assessment unit had shared accrued knowledge on "Indian Climate" which is the driver for the wind resource in the country and was found most useful by the participants. Topics as varied as Small wind turbines, wake in wind farms and their impact on power generation, Fault ride through requirements of turbines, balance life assessment of wind turbine assets, wind energy forecasting techniques, solar based refrigeration for Wind Turbine applications, cloud computing for NIWE & energy security: role of renewable energy were covered by different resource personnel from OSWH&IB, WTT, KS&M, S&C and ESD units. The participants benefited immensely out of the lecture & discussions post the lecture sessions.

Nine Post graduate students from various universities have been accorded permission for the current academic year to take up research oriented projects for their course work thesis completions. They are placed under the supervision of various staff from within the institute. Research Work as varied from Low Voltage Ride Through (LVRT) for existing turbines, to, effect of multiphase flow over aerofoil have been taken as areas of work. The knowledge generated would be shared with all the stakeholders in renewable energy and select works would be taken up as extended research projects.

The work group facility opened by Joint Secretary (WE), Ms. Varsha Joshi, IAS, for the use of engineers to hone their skills in various latest renewable software has found a very good patronage from both within and outside NIWE. The patronage hours for various inter-disciplinary specialization are shown below.



Group-I	Wind Turbine - Aero Mechanical Design
Group-II	Wind Resource Assessment & Wind Farm Planning
Group-III	Electrical & Electronics and Grid Power Quality
Group-IV	Computational Analysis and Simulation

Access patronage

During the celebration of the Hindi fortnight the unit provided the needed support to conduct some of the contests like official drafting & noting at its facility and full heartedly celebrated the official function.

INTERNATIONAL TRAINING

17th International Training Course on

"WIND TURBINE TECHNOLOGY AND APPLICATIONS"

during 3rd February - 1st March 2016

Detailed information is made available in NIWE website (http://niwe.res.in)

Solar Radiation Resource Assessment

- Quality Controlled data of 3 SRRA stations were supplied to 3 stake holders under SDSAP policy.
- Calibration of 6 pyranometers and 3 pyrheliometers were carried out for in-house use and 5 pyranometers under commercial project.
- Silvassa SRRA station was relocated to Panaji and commissioned on 28th July 2015.
- Mr. Prasun Kumar Das visited sites in Himachal Pradesh and Khirvire/Kombhalne, Maharashtra in connection with collection of ground truth information for a project with SJVN, New Delhi.
- Micrositing carried out IIT Rajasthan new campus at Karwad for the relocation of Jodhpur SRRA station.
- Final report submitted to SJVN, New Delhi in connection with the consultancy project taken up in Himachal Pradesh & Maharashtra.
- Training program under PPA mode with GSES, New Delhi on Design & Installation for stand alone, roof top grid connected and MW scale solar power projects conducted at NIWE, Chennai during 20th to 24th July 2015 & 14th to 16th September 2015.
- Kaushal Chhatbar, Suntrace GmbH, Germany visited SRRA unit in connection with the up gradation of quality control algorithm during 17th to 28th August 2015.

Panaji SRRA station

Collection of Ground truth information at Kharagoda, Gujarat

- Mr. R.Sasi Kumar visited sites at Kharagoda, Surendra Nagar dist, Gujarat in connection with collection of ground truth information for a project with SJVN, New Delhi.
- A training program on Solar Energy was conducted exclusively for M/s. Suzlon Energy Ltd. (SEL) at Pune during 4th to 6th August 2015.

PROMOTION

The following officials has been promoted with effect from 1st January 2015.

Name	Cadre From	Cadre To
Dr. G. Giridhar	Director	Deputy Director General
Mr. A. Mohamed Hussain	Director	Deputy Director General
Mr. S.A. Mathew	Additional Director	Director
Mr. A. Senthil Kumar	Additional Director	Director

Invited lecture delivered / meeting attended by NIWE Official in external forums

Dr. S. Gomathinayagam, Director General

- 14th Edition of "Green Power Conference & Exposition on Renewable Energy Technologies" at ITC Grand Chola, Chennai on 2nd July 2015.
- Visit to Suzlon Blade Test Center, Vadodara on 15th July 2015.
- Meeting on Setting up of Blade Test Centre in India at New Delhi on on 16th July 2015.
- Stake Holder's Meeting at MNRE New Delhi on 16th July 2015.
- Meeting on Bird Migration Study organized by IWTMA at Bengaluru on 21st July 2015.
- Meeting of the Consultative Committee of Members of Parliament at The Parliament House, New Delhi on 3rd August 2015.
- Operational Review Meeting (ORM) at New Delhi on 4th August 2015.
- Meeting of RDSPAC to consider R&D Project Proposal on SWES at New Delhi on 5th August 2015.
- Invited as speaker on Shell Lubricants Global Lecture Series 2015 organized by Shell India Markets Private Limited at Bengaluru on 10th August 2015.
- Attended ET 42-Wind Turbines Sectional Committee Meeting at BIS, Manak Bhavan, New Delhi on 19th August 2015.
- Attended Standing Committee on Energy meeting – "Energy access in India – Review of current States and Role of RE" at Paliarment House, New Delhi on 20th August 2015.
- Attended the Standing Committee on Energy-Examination of the subject "Energy Access in India-Review of current status & role of Renewable Energy at Delhi on 26th August 2015.
- Attended 1st Foundation Day of AREAS at Bengaluru on 27th August 2015.
- Attended Interaction Meeting by Hon'ble Minister (I/C) Power, Coal & NRE and also the launch of GIS based wind resource Atlas at 100 meter AGL by Hon'ble Minister at New Delhi on 2nd September 2015.
- Attended Global Investors Meet at Chennai Trade Centre, Chennai on 9th September 2015.
- Attended the Industrial Exemption Committee meeting at Land Reform Department, Chennai 11th September 2015.
- Offshore Wind Energy Development in India Meeting at MNRE New Delhi on 17th September 2015.
- Attended the Standing Committee on Energy-Examination of subject "Energy Access in India-Review of current status & role of RE & Development and status of small hydro sector at New Delhi on 22nd September 2015.
- Lecture delivered in National Seminar on "Renewable Conversion Technologies" at RMK College on 28th September 2015.

K. Boopathi, Additional Director & Head, WRA

- Attended Appraisal Committee Meeting on Reassessment of Wind Power Potential of India at MNRE, New Delhi on 14th July 2015.
- Attended national meet programme for promoting space technology based tools and applications at New Delhi on 7th September 2015.

A. Haribhaskaran, Deputy Director (Technical), WRA

- Attended RDSPAC meeting at MNRE, New Delhi during 5th & 6th August 2015.

S.A. Mathew, Director & Head, WTT

- Participated in the "Industry Partnership Meet" at Veltech Dr. RR & Dr. SR Technical University, Chennai on 29th August 2015.
- Attended the ET 42 Sectional Committee Meeting organized by BIS at Delhi on 19th August 2015.

A. Senthil Kumar, Director & Head, S&C

- Attended "Offshore Wind Energy Training Course" organized by DNV GL Energy Academy at New Delhi on 22nd September 2015.
- Attended meeting on deliberation on technical aspects and implementation issues of ROP in Respect of petition No 420/MP/2014 in connection with LVRT conducted by Southern Regional Power Committee (SRPC) at TANTRANSCO / TANGEDCO office, Chennai on 20th July 2015.
- Attended 2nd meeting on "Bill of Material Evaluation / approval committee for issuance of duty exemption

certificates for manufacturers of WOREG and its components" at New Delhi during 16th to 17th July 2015.

- Participated in 6th meeting of Wind Turbines Sectional Committee, ET (42) of BIS at BIS, New Delhi on 19th August 2015.

S. Arulselvan, Assistant Engineer

- Attended meeting on deliberation on technical aspects and implementation issues of ROP in Respect of petition No 420/MP/2014 in connection with LVRT conducted by Southern Regional Power Committee (SRPC) at TANTRANSCO/TANGEDCO office, Chennai on 20th July 2015.

P. Kanagavel, Additional Director & Head, ITCS

- Delivered a lecture on "Wind Energy Applications" at National Institute of Technical Teacher Training and Research (NITTTR), Taramani, Chennai on 14th July 2015.
- Delivered a lecture on "Recent Trends in Wind Energy Technology" at Karpaga Vinayaga College of Engineering & Technology, Chennai on 22nd August 2015.
- Delivered a lecture on "Wind Turbine Technology & Applications" at Agni College of Technology, Chennai on 1st September 2015.
- Co-ordinated & supported the Wind Energy Technical Symposium by NIWE jointly organized with M/s. UBM India Private Limited on 24th September 2015 at Renewable Energy India Expo 2015 held during 23rd to 25th September 2015 at Greater Noida.

Prasun Kumar Das, Assistant Director (Technical) Contract, SRRA

Delivered a lecture on Solar Resource in India for CSP in CSP Focus 2015 Conference at Delhi during 1st to 3rd July 2015.

Karthik.R, Assistant Director (Technical) Contract, SRRA

- Delivered a lecture on Solar Radiation Resource Assessment Study in India at the training program on Solar Energy organized exclusively for Suzlon Energy Limited at Pune on 4th August 2015.
- Visited NISE to impart training on soiling experiment to NISE officials along with Mr. Kaushal Chhatbar, Suntrace GmbH, Germany.

Visits Abroad

K. Boopathi along with Mr. Tarun Kappor, Joint Secretary, MNRE attended meeting on New Technology and Renewable Energy Work Group (NTREWG) at Washington, USA during 16th to 18th September 2015.

Publications

S. Gomathinayagam, article for EPR Magazine's Wind Power Special Issue on Wind Turbine Technologies & NIWE.

National Wind Energy Technical Symposium

NIWE in association with UBM India had organized a "National Wind Energy Symposium" on 29th September 2015 for the Technical persons in the wind industry at the 9th Renewable Energy India Expo at Greater Noida. Nearly 30 people from industry has attended the training and received good feedback from the participants. The following lectures has been delivered during the symposium by NIWE experts.

1	Introduction and Status of Wind Energy Technology	Dr. S. Gomathinayagam
2	Wind Measurement and Techniques	Mr. A.G. Rangaraj
3	Wind Turbine Components	Mr. J. C. David Solomon
4	Small Wind Turbine Testing and Hybrid System	Mr. Rajesh Katyal
5	Wind Turbine Testing and Measurement Techniques	Mr. S. A. Mathew
6	Certification of Wind Turbines	Mr. A. Senthil Kumar

The following NIWE staff delivered lecture(s) in the 16th International Training Programme on "Wind Turbine Technology & Applications" held during 12th August to 8th September 2015 and Special Training Course on "Wind Energy Technology" for System Operators of Load Dispatch Centres held during 13th to 18th July 2015

S.No.	Topic	Speaker
1	Introduction and Status of Wind Energy Technology	Dr. S. Gomathinayagam
	Wind Turbine Tower	
2	Role of NIWE in Wind Energy Development	Mr. P. Kanagavel
	Wind Power Development in India	
3	Overview of Wind Turbine Components	Mr. J. C. David Solomon
	Drive Train Concepts	
	Basics of Wind Turbine Aerodynamics	
4	Wind Turbine Gear Box	Mr. N. Raj Kumar
5	Wind Turbine Generators	Mr. M. Anvar Ali
6	Control and Protection System in Wind Turbine	Mr. S. Arulselvan
7	Wind Turbine Foundation	Mr. Rajesh Katyal
	Small Wind Turbine Testing and Hybrid Systems	
8	Wind Resource Assessment and Techniques	Mr. K. Boopathi
	Forecasting of Wind and Energy Production	
9	Wind Measurement and Instrumentation	Mr. B. Krishnan
10	Guidelines for Wind Measurements	Mr. A. G. Rangaraj
11	Wind Data Measurements and Analysis	Mrs. G. Arivukkodi
12	Wind Measurements by Remote Sensing Instruments	Ms. M.C. Lavanya
13	Design and Layout of Wind Farms	Mr. J. Bastin
14	Type Certification of wind turbine and overview of Design Requirements as per IEC 61400 - 1	Mr. A. Senthilkumar
15	Wind Turbine Testing & Measurement Techniques	Mr. S. A. Mathew
16	Instrumentation for Wind Turbine Testing	Mr. M. Saravanan
	Power Curve Measurements	
17	Safety and Function Testing	Mr. Bhukya Ram Das
18	Grid Integration of Wind Turbine	Mrs. Deepa Kurup
19	Offshore Wind Energy: An Overview	Mr. M. Joel Franklin Asaria
	Environmental Aspects of Wind Turbine Technology	
20	Indian Government Policies and Schemes	Mr. A. Mohamed Hussain
	Overview of Testing facilities of WTTS / WTRS	
21	Solar Radiation Resource Assessment	Mr. R. Karthik

Training / Conferences / Seminars attended by NIWE Officials

Dr.S.Gomathinayagam, Director General

- IRENA Workshop RE Map 2030 on 24th August 2015.
- National workshop on Lab Infra Structure for Testing, Standardization and Certification for RE Deployment in India on 10th September 2015.

Dr. S.Gomathinayagam, Anuradha Babu, J. Rekha have attended Workshop on RTI by ISTM at NIWE, Chennai on 24th July 2015.

K.Boopathi, Additional Director & Head, WRA

- Workshop / meeting on Reassessment of Wind Potential in the country at C-STEP, Bangalore during 21st & 22nd July 2015.

WRA Unit

- M.C. Lavanya, Assistant Director (Technical) & G. Arivukkodi, Assistant Engineer attended seminar on MatLab at Le Royal Meridien on 8th July 2015.
- Unit Head, Scientist, Assistant Director & Engineers attended workshop on SODAR technology and its application at Sathyabama University on 16th July 2015.

S.A.Mathew, Additional Director & Head, WTT

- Attended the National Workshop on Lab Infrastructure for Testing, Standardization, Certification and Inspection for Renewable Energy Development Programme at India Habitat Centre, New Delhi on 10th September 2015.

A.Senthil Kumar, Director & Head, S&C

- Attended the "National Workshop on Lab Infrastructure for Testing, Standardization, Certification and Inspection for Renewable Energy Development Programme" Organized by MNRE at New Delhi on 10th September 2015.

M.Anvar Ali, Additional Director & Head, ESD

Attended workshop on "Stakeholder Consultation on gross" conducted by USAID, PACE-DTA program at Bengaluru on 11th September 2015.

Dr.G.Giridhar, Director & Head, SRRA

Participated on C-STEP workshop at Bangalore during 21st to 22nd July 2015.

Prasun Kumar Das, R.Kathik & Jayalakshmi

Attended the 3 days course on Environmental impacts of renewable energy at Chennai during 9th to 11th September 2015.

Right to Information Act 2005

All NIWE staff have attended one day training programme on "Right to Information Act 2005" at NIWE, Chennai on 24th July 2015.

IWTMA Knowledge Forum

All NIWE staff have attended "One day Knowledge Forum on Recent Trends in Wind Turbine Testing Validation and Certification" conducted by UL DEWI in association with NIWE & IWTMA at NIWE, Chennai on 29th July 2015.

Official language Hindi Workshop

All NIWE staff have attended one day Official language Hindi workshop - use of Digital tools on computer in Hindi organized by NIWE at NIWE, Chennai on 17th August 2015.

Environmental Management of Renewable Energy Projects

P. Kanagavel, Joel Franklin Asaria, J.C. David Solomon, Arivukkodi, Karthik & Prasun Kumar Das have attended three days workshop on "Environmental Management of Renewable Energy Projects" at Hotel Aloft, Chennai during 9th to 11th September 2015.

One day International Workshop

All Scientifical staff have attended one day Inception workshop on "Joint Indo European Offshore Wind Research & Development platform of support Offshore Wind in India" organized by NIWE along with FOWIND and GWEC at NIWE, Chennai on 18th September 2015.

Offshore Wind Energy Workshop

Rajesh Katyal, S.A. Mathew, A. Senthil Kumar, P. Kanagavel, J.C. David Solomon, A. Haribhaskaran, J. Bastin & G. Arivukkodi have attended one-day work shop for industrial professional on Offshore Wind Energy Course conducted by DNV-GL at New Delhi on 22nd September 2015.

नीवे NIWE Issue-46, July - September 2015 pavan Newsletter of NATIONAL INSTITUTE OF WIND ENERGY, Chennai

MODERN SCADA & CONDITION MONITORING OF WIND TURBINES

Sureshkumar. R, Lead Engineer, Turbine software Testing & Control system
Vestas Technology R&D E-mail: giridhar.niwe@gov.in

Introduction

SCADA, or supervisory control and data acquisition, is a data-gathering system to provide real-time and historical information for supervision and remote and local control of individual or multiple wind turbines. The system is accessed through a web-based application or software on computers at the wind farm itself or anywhere where internet connection using transmission control protocol (TCP) or internet protocol (IP) is possible. Increasingly, there is a move towards using other displays such as smartphones. Scada data was originally used primarily for simple monitoring and control of turbines, but is now serving a growing number of purposes far beyond the basic needs of reducing downtime and increasing availability. Generally, each turbine manufacturer has a proprietary Scada system. Other software is therefore needed in order, for example, to compare the performance of and to control different turbine types.

Tracking key turbine and wind-farm performance parameters and comparing these with historical data and set values is another process based on Scada data that can greatly benefit wind-energy economics. Reliability and availability of turbines can be improved, increasing their output and decreasing the cost of electricity generated. Intelligent Scada systems combined with turbine control systems can also manage power consumption requirements and turbine efficiency. Prediction and forward-planning of maintenance cycles using Scada input can reduce costs for equipment, human resources and stock material.

In this paper, we describe our exploration of existing wind turbine SCADA data for development of fault detection and diagnostic techniques. Our ultimate goal is to be able to use SCADA-recorded data to provide advance warning of failures or performance issues.

Access to data for the wind turbine

The access of data is crucial for the efficient operation and maintenance of wind turbines.

A general trend is to use more condition-based maintenance (CBM) and opportunity-based O&M. SCADA and CBM data will play an important role in the development of improved O&M methods.

During warranty turbine OEMs have a large amount of data available from their SCADA and CMS systems. These data can be used to dispatch service technicians. Out of warranty the operators have typically access to more restricted SCADA and CMS datasets, depending on their capability. Many wind turbine manufacturing companies are now well ahead in this area. In general, onshore O&M is very heavily dominated by breakdown repair (corrective), because operators are unable to view online data in a timely way and plan to mitigate deteriorating faults.

Intelligent use of SCADA and CMS

Main challenges in the operation and maintenance of wind turbines lies in the handling of large volumes of data, and relating this data into useful models for planning and prediction. A more structured and automatic approach to the handling of integrated SCADA and CMS data from wind farms will help maintenance managers and asset managers to see clearly in advance where risks lie and schedule maintenance in a constructive way on the basis of condition.

Reliability and maintenance component analysis

There is a need of understanding the underlying failure Mechanisms of the components and on how these could be impacted by O&M. The following different needs have been identified:

Methods for failure detection

Fatigue is one of the most frequent component failures that are why it is important to develop better methods for indicating fatigue and methods for monitoring those indicators and in connection with this to develop methods for prevention of fatigue.

Methods for failure prognosis

The resulting systems and data from the use of SCADA and CMS could be used for fault prognoses. There would be a need of research developing models for critical components relating failure events to maintenance impact. Although there is on-going research in this area, there is still a long way to go before quantitative models are used in a systematic way to support in the O&M.

Wind turbine Monitoring

This session summarize that the wind farms/turbine monitoring will drastically shows the optimal benefits of the O&M.

Monitoring of the turbines can vary based on the OEM's and the customers because the customers who has different model wind turbines from difference manufacturer so they have their integrated monitoring tool for all those turbine models.

So let us take the standard and mostly used method of monitoring the wind turbine/farms.

- SCADA
- Conditioning monitoring device
- Oil analysis
- Thermography inspections
- Software tools for WTG monitoring

SCADA for wind turbines

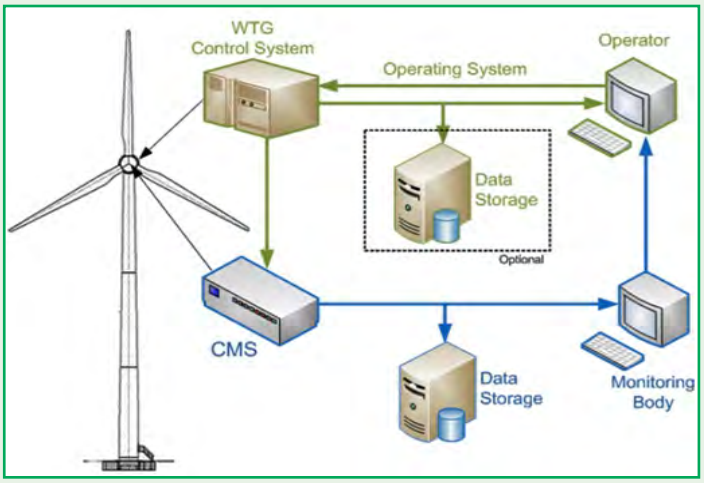
Using SCADA (supervisory control and data accusation) is mainly used by the turbine manufacturer for monitoring those turbines from various wind farms.

- SCADA can be used to monitor the state of wind farm in real time,
- It can store that information in a tidy and recoverable way to make it use in the future to analysis the turbine for any failure analysis.
- Function order can be send to the wind turbines
- Alarm system and state changes can be made
- Accumulated and comparative data can be used for analysis
- Production and availabilities of the Data
- Trends for the turbine behavior can be see and analyzed
- Monitoring of the metering device
- Supervision of Met Mast
- Also the SCADA system is now being developed by the wind turbine manufacturer itself with the following features
- New Generation of SCADA system is now being developed with remote web access with a friendly and easy to use with user interface.
- Modular architecture to support two configuration in order to fit with customer needs while maintaining the reliability
- Open and standard protocols to facilitate the third party system integration
- Advances reporting tools like Daily generation details (DGS report) and trend data viewer is also included in the SCADA application to help the wind farm operators to take the right decisions.
- Optional tools for power regulation and environmental protection to optimize the production while complying with current legislations.

Conditional Monitoring Device in wind turbines

Conditional monitoring device is mainly used in the wind turbines to take the proactive measure and to plan the predictive maintenance activities in the turbines by which we can avoid the large corrective and large failures of the turbines, which will reduce the O&M cost.

The architectural structure of the CMS system installed in the turbine is shown below in the diagram.



Architectural structure of the CMS system

The advantages of using the CMS in the wind turbine is as below

- Reduce number of failures -> reduce number of repairs
- Reduce severity of failures -> reduce cost of repair
- Reduce turbine downtime -> reduce revenue losses

OIL sample analysis for wind turbines

Oil sample is also mainly used in the wind turbines to take the proactive measure and to plan the predictive maintenance activities in the turbines by which we can avoid the large corrective and large failures of the turbines, which will reduce the O&M cost.

The main Objectives of the oil sample analysis is to

- Monitor parameters not covered by real-time instruments
- Elemental analysis to pinpoint failed components
- Assist root cause analysis
- Evaluate the functionality of conditioning devices

The Typical Parameters which will be analyzed in the oil sample collected from the Gearbox of the wind turbine will be

Fig. 2 - An effective oil analysis program characterizes the condition of the lubricant and equipment as well as contamination.

as mentioned below

- Particle counts
- Water content
- Total acid number
- Viscosity
- Particle element identification

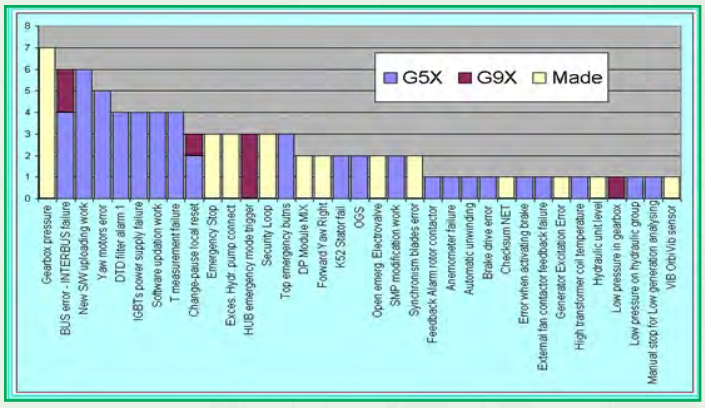
Wind Turbine Analysis- Alarm analysis

Typically, alarms are used to indicate the need for emergency action to protect a Wind turbine from running into a risky condition.

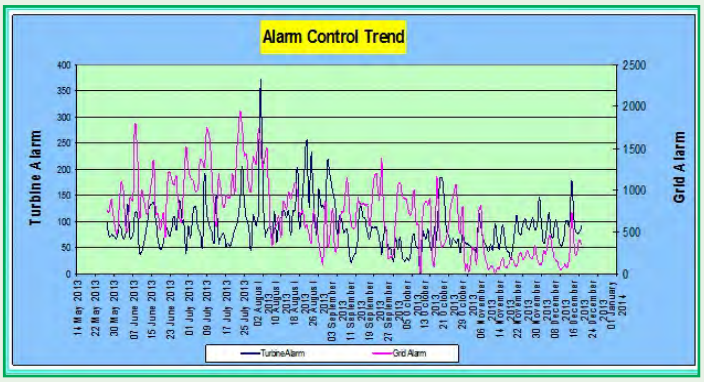
Whenever the Wind turbine is running with a malfunction, corresponding alarms will be triggered by key component signals exceeding threshold reference limits. Alarm occurrences could be described by an event chain or alarm time-sequence, as usually observed when a malfunction occurs, which intuitively could be related to sequence of a failure mechanism.

The accuracy of these time-sequences relies on the time resolution of the data collection system. In addition, under some critical wind turbine conditions alarms that need to rapidly activate emergency controls passed through a faster communication channel, which lead to some alarms being triggered appearing earlier than other prior alarms. Therefore, alarm sequences may vary from one malfunction to another or related alarms may appear simultaneously. As a complex and complete system, wind turbine alarms appear as complex and variable pattern with a rapidly increasing pace as a malfunction progresses and successive alarms are triggered, rather than as a straight time-sequence related to the failure mechanism. In order to deduce the information embedded in the alarms, a scientific methodology is needed to extract the correlation between the alarms and associated wind turbine malfunctions.

Alarm classification on based on component wise



Alarm Trend on daily basis



Conclusion

To conclude, clearly SCADA has come a long way in recent years but the sophisticated advances in the pipeline will make further contributions to integrating wind farms into electricity supply systems and the energy business worldwide within the foreseeable future.

SCADA experts say advances of the upcoming technology lie in four main areas.

- Wider use of modular integrated communications systems in both capacity and function, designed to work together through open standards.
- Web-enabled communication for all critical components in the remote turbines and substation to facilitate remote state monitoring diagnostics.
- Distributed intelligence in components to enable reduced functionality in the event of errors.
- A "seamless and location-independent IT and communication network" from the operator's point of view.

By using CMS and SCADA obviously, the goal is to reduce the annual expense of those expressions in the numerator and maximize annual energy production in the denominator. A few best practices can be highlighted by using this equation to observe asset intelligence ideas in planned and unplanned maintenance, annual energy production, and means to visualize intelligence.

Published by :
NATIONAL INSTITUTE OF WIND ENERGY (NIWE)
An autonomous R&D Institution under the Ministry of New and Renewable Energy (MNRE), Government of India
Velachery - Tambaram Main Road, Pallikaranai, Chennai - 600 100.
Phone : +91-44-2246 3982, 2246 3983, 2246 3984 Fax : +91-44-2246 3980
E-mail : info.niwe@nic.in URL : http://niwe.res.in