

EDITORIAL



With 23 GW and 5th place in Wind Energy installed capacity in the World, India is looking for faster growth rate of market in the wind sector and more installed capacity. MNRE, while aiming at 60 GW of wind power by

2022 is also aiming at 100 GW of Solar power to be installed in India. Wind Sector is getting revived with the liberalization of accelerated depreciation, special customs duty exemption and special additional duty benefits for manufacturing in India. The "Make In India" emphasis would also enable the already established manufacturers to further increase their productivity with liberalized benefits. There may be a policy for promotion of export of wind energy equipment from India. In addition, a policy on repowering, a policy on offshore wind power in India and enforcement of renewable portfolio obligations with all the States in India, are the great expectations of wind farm developers apart from payment, evacuation and land access guarantees.

We at NIWE are fully geared to offer wind power forecasting services on a commercial basis at any point in India for effective scheduling and dispatching of wind power generation mix in the Nation's electricity grid. NIWE is also making efforts to offer International accredited certification services in a joint collaborative mode in India. The efforts will certainly go a long way in augmenting the 'Make In India' really implementable in the case of wind energy sector.

During this period several small wind turbine testing have been in progress at our Wind Turbine Testing and Research Station at Kayathar. In the Wind Resource Assessment, the validation of 100 m mast measurement is in progress at over 70 locations in India. The unit also gives highly specialized training programmes to SNA officials on importance of Wind Resource Assessment and the need for their excellent co-operation.

During this period, the new Joint Secretary (WE) Ms. Varsha Joshi, IAS has inaugurated in NIWE campus the work group activities under four highly specialized areas viz. (i) Aero-Mechanical Design, (ii) Wind Resource/Wind Farm planning and

assessment (iii) Electrical/Electronics with grid quality power and (iv) computational modeling and simulation. She also inaugurated at Wind Turbine Research Station, a fitness Centre for the staff at Kayathar.

The Standards and Certification Division has released the main list of finalized models and manufacturers of wind turbine equipment in India. NIWE has also signed MoU for international collaboration for offering certification services for wind turbines and capacity building in India.

Almost 10 additional components have been finalized, which are part of wind turbine generator in India for exemption under special additional duty by the Committee constituted by the Ministry co-ordinated by Standards and Certification Unit. In Wind Turbine Testing, 2 wind turbine generator (WTGs) are instrumented for testing during this windy season.

The 12th International Training programme under AIFS-II of MEA for participant from Africa sponsored was successfully conducted. The Engineering Service Division has made a surveillance system installed and commissioned with 12 cameras located in the campus and a new Solar blinker sign board of NIWE has been installed at the Median of the road in front of the Institution, apart from installing a 200 LPD solar water heater, catering to the needs of guest house and canteen.

The Officers from SRRA and WRA have visited Space Application Centre (SAC), ISRO, Ahmedabad for discussing about how to effectively use satellite data and resource maps. SRRA has also commissioned a Calibration Laboratory, an SRRA Station with Advanced Measurement Station (including cloud cover, aerosol quantification and their influence in Radiation) at Prathyusha Institute of Technology and Management, Thiruvallur.

The staff members delivered several invited lectures in external forums in India and abroad and contributed publications in peer reviewed journals.

We would like to invite your valuable comments on going forward with more industry interaction to deliver services and products to the wind and solar sector in this Country.

Dr. S. Gomathinayagam, Director General

Contents

- ♦ NIWE at work - 2
- ♦ Repowering of Wind Farms: Issues and Proposals in India - 13

Editorial Board

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Research and Development

Testing of Small Wind Turbine

Presently there are 8 Small Wind Turbines of various makes under test at WTRS, Kayathar. Duration test for one model UE 42 of M/s Unitron was completed. Review of design documents for the models AP 5.45 of M/s Alpha Power Limited and VAATA SMART 15 of M/s Vaata Infra Limited are in progress.



Dismantling process of the Model UE 42 at WTRS, Kayathar

A novel hybrid energy system for supplying isolated loads with FPGA based Energy Management Scheme

NIWE has initiated a project in association with NIT, Tiruchirappalli aimed at design and development of a micro grid system based on hybrid renewable energy sources such as wind, solar and biomass/biogas for reliable power supply at remote locations. Through this, energy management using various renewable energy sources in remote locations will be demonstrated with the help of advanced digital controllers such as FPGA. The first milestone of the project involving experimental study on a wound rotor induction generator and algorithm for FPGA based inverter control have been completed.

Wind Resource Assessment

During the period of October to December 2014, 1 new wind monitoring station has been established in Pondicherry and after completion of the work 5 wind monitoring stations have been closed (3 in Orissa, 1 in Arunachal Pradesh & 1 in Mizoram). Presently, 130 wind-monitoring stations are operational in 16 States and 1 Union Territory, under various wind monitoring projects being funded by the Ministry of New and Renewable Energy (MNRE) as well as various entrepreneurs/wind project developers.

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

- Site Validation & Generation Estimation for 3 projects.

- Verification of procedure of wind monitoring for 22 sites.
- Wind Power Density Map for 1 site.
- Technical Due Diligence for the proposed 104 MW wind farm.
- Pre-feasibility study for 1 site.
- Report on Wind Monitoring Study for 1 site.

R&D Projects progress in WRA Unit

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

NIWE in collaboration with GVP-SIRC Vizakapatnam 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 by comparing the measurements. At present, the proto-type development is in progress.

Repowering of Existing Wind Farms in Tamil Nadu

Collection of required wind turbines related information in Kanyakumari & Tirunelveli district have been initiated, and the information collection is under progress.

Wind Power Forecasting

- M/s. BLP has provided set of historical data to carry out forecasting for its 10.2 MW wind farm located at Jath, Maharashtra. NIWE has processed the historical data and made necessary arrangements to carry out forecasting. New forecasting model is being prepared by M/s. Vortex.
- Error analysis of one month data of Kandamanur site is in progress.
- Vortex's Forecasting error analysis has been carry out.

Estimation and Validation of WPP upto 100 m level of 7 States in India



At the time of release of Indian Wind Atlas in April 2010, NIWE could validate the potential of 49 GW at 50 m level, while at 80 m level it was stated as 103 GW indicative and to be validated. To validate the same NIWE has established 73 (10 in Andhra Pradesh, 12 in Gujarat, 11 in Rajasthan, 13 in Karnataka, 8 in Maharashtra, 7 in Madhya Pradesh and 12 in Tamil Nadu) Wind monitoring stations in the MNRE CFA funded project on 'Estimation & Validation of Wind Power Potential upto 100 m level in 7 States of India', the data acquisition is in progress, in most of the sites.

- One year continuous data acquisition from 23 WMS locations (5 in Andhra Pradesh, 4 in Gujarat, 4 in Maharashtra, 7 in Karnataka, 1 in Rajasthan and 2 in Tamil Nadu) have been completed successfully.
- Continuous monitoring and receiving real time wind data from 72 stations in 7 States.
- Monthly Data Analysis, verification and preparation of Interim reports are in progress.

Wind Resource Assessment Studies

- Rectification work at Lakshmanpur for M/s.THDC has been carried out.
- Installation & Commissioning of 80 m tall mast at Kudge for M/s.NTPC has been completed.
- Revised draft report for M/s.THDC has been prepared.
- Interim report for 6 sites in Kerala for M/s. ANERT, Ennor port, 1 site in Uttar Pradesh for M/s. THDC and Doon University has been sent.

SPECIAL TRAINING COURSE

In order to create awareness among the SNA officials regarding the importance of Wind Resource Assessment, a special Training Course on "Wind Resource Assessment & Wind Energy Technology" was organized by NIWE from 10th to 18th November 2014 at NIWE premises.



Shri. Ajay Shukla, Director, MPUVNL inaugurating the course

The training course was attended by 30 participants from 13 States (Andhra Pradesh, Arunachal Pradesh, Chhattisgarh, Jammu & Kashmir, Karnataka, Kerala,

Madhya Pradesh, Mizoram, New Delhi, Rajasthan, Sikkim, Telangana and Uttar Pradesh) and 1 Union Territory (Lakshadweep) across the country. The 9 days programme included classroom lectures, field & factory visits and practical training sessions to provide complete knowledge transfer to the participants.

The participants were provided with Course Material which was a compilation of the write-ups of all the presentations / lectures submitted by the lecturers.

As part of the training course, the practical training with Wind Resource Assessment, Instrumentation, Testing and R&D equipments was arranged apart from the factory visits to M/s. Leitwind Shriram Private Limited at Gummidipoondi where they had a chance of listening from the industry experts who are actually in the process of making wind turbines and visiting the manufacturing facilities.

Further, the participants also travelled to southern part of Tamil Nadu to visit Wind Turbine Test / Research Station, Kayathar and got to know about large and small wind turbine testing process and they also had opportunity of visiting wind farms in and around Kanyakumari, where wind turbines are installed in large numbers.

The 9 days training session was concluded on 18th November 2014 with the Valedictory function chaired by Shri. Karl Friedrich, TUV Rheinland, Germany and distributed course Certificates to the participants.



Chief Guest distributing Certificates

The intellectual level of the course was rated by 46 % of the participants as Excellent and the rest felt good. Therefore, the selection of topics has been good and well received. The range of the selected topics for the training programme was well appreciated and 100% of the participants had rated it excellent and good. The suggestions of the participants may be considered in the upcoming trainings. The participants were very much satisfied by the quality of lectures and hospitality arranged.

Other Programmes

- K. Boopathi, Additional Director & Head carried out site selection for the project WRA uncovered/new areas 2010-11 in Pondicherry during 4th & 5th October 2014.
- First, second & third committee meetings for selection of suitable vendor for supply of satellite images and processed output Map layers in Vector format for the States of Andhra Pradesh & Telangana have been conducted at NIWE, Chennai on 14th October 2014, 1st November 2014 & 9th December 2014 respectively.
- First & second technical committee meeting have been conducted to finalize the specification of the data set to be procured before floating the global tender for procurement of Basic Wind Parameters map for the Re-assessment of wind potential in India at NIWE, Chennai on 29th October 2014 & 11th December 2014 respectively.
- First Committee Meeting for design and development of a photonic system for real time remote monitoring of wind and other air parameters has been conducted at NIWE, Chennai on 14th November 2014.
- K.Boopathi, Additional Director & Head J. Bastin, Assistant Director (Technical) visited Space Application Centre (SAC, ISRO), Amedabad for familiarizing with satellite based tools and data set during 26th to 28th November 2014.
- J. Bastin, Assistant Director (Technical) visited Rameshwaram, Ramathapuram to gather relevant information from EB Sub-stations towards preparing preliminary micrositeing report.
- M. Joel Franklin Asaria, Additional Director - field verification has been carried out for Technical approval for Wind farm at Idukki & Palakkad for M/s. ANERT on 11th & 12th December 2014.

Wind Turbine Testing

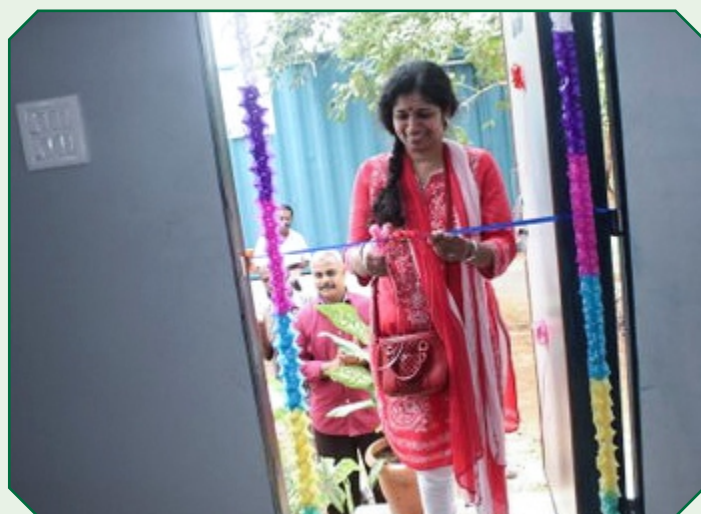
Two projects are in progress for :

- Type Testing of XYRON 1000 kW wind turbine at Richadewda, Ratlam District, Madhyapradesh of M/s. XYRON Technologies Limited.
- Type Testing of GVSL 1700 kW wind turbine at Kampanari Pudhukudi (Village), Tenkasi (Taluka), Tirunelveli District, Tamilnadu of M/s. Garuda Vayu Shakti Limited.

Wind Turbine Research Station

Various Operation and Maintenance activities like conditioning of Nine 200 kW MICON Wind Electric Generators transformers and transformer yards are being carried out as a part of preparation of the machines for uninterrupted operation during the windy season 2015.

Smt. Varsha Joshi, IAS, Joint Secretary, MNRE inaugurated the Fitness Centre for staff at WTRS, Kayathar.



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

- 7 delegates from Korean Consulate, Chennai visited on 19th September 2014.
- 29 officials from various State Nodal Agencies visited on 14th November 2014.
- 4 officials from Central Electro Chemical Research Institute (CECRI), Karaikudi, Tamil Nadu visited the WTRS, Kayathar for feasibility study on energy storage option on 24th November 2014.
- 4 officials from National Aeronautics Laboratory, Bangalore.
- 21 participants of 12th International Training Programme on "Wind Turbine Technology and Applications" Specially for African Countries visited on 5th December 2014.
- 9 students & 1 staff from Rajasthan Technical University, Kota visited on 9th December 2014.
- Smt. Varsha Joshi IAS, Joint Secretary along with MNRE officials visited and inspected the various R&D / Testing facilities at WTRS on 18th October 2014.



Ms. Varsha, Joint Secretary (wind) MNRE, New Delhi visited the R & D facilities at WTRS, Kayathar

Standards and Certification

- An agreement has been signed with M/s. Southern Wind farms Limited to take up the project on renewal of Certificate of "GWL 225" wind turbine model under Category-III as per TAPS-2000 (amended). Review / verification of documentation in connection with renewal of Certificate of "GWL 225" wind turbine model is initiated.
- Review / verification of documentation provided by various wind turbine manufacturers for more than 55 wind turbine models in connection with Revised List of Models and Manufacturers of wind turbines (RLMM) – Addendum – I to Main List is in progress.
- As a part of RLMM process, Additional Director / Head, S&C and S&C Engineer carried out the verification of the manufacturing facilities of various wind turbine manufacturers.
- A Memorandum of Undertaking (MOU) was signed by M/s. TUV Rheinland Industrie Service GmbH & M/s. TUV



Signed MoU with TUV Rheinland

Rheinland (India) Private Limited with NIWE in connection with cooperation in the area of type certification of wind turbines in India.

- Additional Director & Head, S&C participated in the IECRE Management Committee (REMC) and Forum meeting - Wind Energy held at Boulder, Colorado, USA.
- MNRE has constituted an Advisory Committee for the recommendation of Wind turbine Components in connection with exemption of "Special Additional Duty (SAD)", appointing Director General, NIWE, as Chairman and Additional Director & Head, S&C as Member Secretary and other external experts. S&C unit organized the Advisory committee meeting on exemption of Special Additional Duty (SAD) at NIWE, Chennai & recommendation / opinion of the Committee was sent to MNRE, upon approval of Director General, NIWE.
- S&C Engineer along with MNRE carried out the joint field inspection at M/s. Rothe Erde India Private Limited, Nashik, Maharastra.
- Review / verification of documentation received for a prototype wind turbine model from wind turbine manufacturer in connection with installation of prototype wind turbines in India as per MNRE guidelines is under progress.
- Circulated various draft IEC standards to working group members for comments and voting recommendation for the various draft IEC standards have been prepared based on working group member comments & review by S&C unit and sent to BIS for forwarding to IEC TC 88.
- Co-ordination works with Bureau of Indian Standards (BIS) and NIWE working Group in connection with standards related activities are ongoing.
- The continual improvement and maintaining the quality management system are ongoing.

Information, Training and Commercial Services

12th International Training Course

NIWE had successfully conducted the 12th International Training programme on "Wind Turbine Technology and Applications" during 19th November to 12th December 2014 specially for African Countries. Ministry of External Affairs (MEA), Government of India had sponsored this special course under Africa India Forum Summit – II programme which was supported by the Ministry of New and



Shri. Benedikt Anselman releasing the Course Material

Renewable Energy (MNRE), Government of India.

Twenty one participants from 8 countries Burundi, Ethiopia, Kenya, Malawi, Mauritius, Nigeria, Sudan and Tanzania have attended the training programme with diverse background. Professional levels of the participants were from vocational skill development teachers, engineers and scientific officers as well as higher level officers of ministerial service in the energy sector.

Shri. Benedikt Anselman, Vice President, TUV Rheinland-India has inaugurated the training programme as the "Guest of Honour" and released the "Course Material".

During the course tenure of 24 days, 18 NIWE scientists, 5 manufacturers, 6 developers, 2 consultants and 4 premier academicians have presented forty seven classroom lectures along with case studies apart from practical training, field & factory visits to facilitate a paramount knowledge transfer to the participants.

Participants have also visited Small and Large Wind Turbine Testing and R&D facilities at WTTS / WTRS, Kayathar and



Shri. Alok Ranjan Jha distributing the Course Certificate

large Wind Turbine Manufacturing Factory of M/s. Gamesa Wind Turbine at Mamandur which enabled them to acquire hands on experience on both field and factory.

Shri. Alok Ranjan Jha, Deputy Secretary, East and South Africa Division, Ministry of External Affairs was the chief guest for the Valedictory Function and have presented the Course certificates to all the participants.

Visitors to the NIWE

During the period from October - December 2014, 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.

NIWE facilitates school/college students and industry professionals to visit its infrastructure and learn about the renewable energy with special reference to wind energy and technology.

- 65 Students from RMK Senior Higher Secondary on 8th October 2014.
- 70 Students from St. Johns Public School on 10th October 2014.
- 30 Teachers from NITTR Taramani Chennai on 28th October 2014.
- 68 Students from Vel Tech Dr. R.R & Dr. S.R Matriculation School, Avadi on 7th November 2014.
- 70 Students from Akshayah Matriculation School, Velachery on 1st December 2014.

Engineering Services Division

- CCTV 7PTZ and 5 Fixed Zoom cameras have been installed at NIWE campus, and additional 2 PTZ and 7 Fixed Dome cameras are proposed to be installed.
- Solar blinker new name board at front side of the NIWE main gate, on the road has been installed and is useful, as a indicator as well as safe traffic flow.





- New NIWE LED name board has been installed at reception hall dome on 15th November 2014.



- 200 LPD Solar water heater system has been installed at guest house on 15th November 2014.
- To manage the increasing electricity the demand from 160 KVA to 200 KVA, procurement of Current Transformer & Potential Transformer, work is in progress.
- Construction of front side compound wall with NIWE name board work has been handed over to CPWD, as turnkey execution.
- 6 nos of flood lights have been installed at NIWE backyard for safety and security purpose.

- Installation of Video conference, EOI meeting has been conducted and preparation of minutes of meeting with technical specification are in process.

Solar Radiation Resource Assessment

- A proposal for 100 Low cost SRRA stations was prepared and submitted to the Ministry for approval.
- Relocated the Mandsaur SRRA station to Gwalior and Vellore SRRA station within the campus.
- SRRA successfully established Calibration Laboratory at Prathyusha Institute of Technology and Management (PITAM), Thiruvallur and was inaugurated by Dr. S. Gomathinayagam, Director General, NIWE on 11th November 2014.
- Mr. Kaushal Chhatbar, Suntrace, New Delhi visited SRRA during the period 15th to 17th October 2014, in connection with Quality Control of SRRA data and assessment of 3 - Tier satellite data .
- Officials from Germany visited NIWE for GIZ's SolMap project coverage on 17th October 2014.
- Quality Control check of first delivery of 3-Tier Satellite data was completed and Quality Control (QC) statistics report was sent to M/s. Suntrace for their comments and recommendations.
- SRRA Mobile application on Android and Windows platform launched on 11th November 2014 by Dr. Elena Berger (Fellow), USDOE. The step for getting android application is to go to play store and search NIWE about National Institute of Wind Energy and its SRRA stations across India and install it.
- Micro-siting for relocation of Belgaum and Bellary SRRA stations in Karnataka was carried out during the period 24th to 28th November 2014.

NATIONAL TRAINING

17th National Training Course on “WIND ENERGY TECHNOLOGY”
during 18th - 20th March 2015

INTERNATIONAL TRAINING

15th International Training Programme on “WIND TURBINE TECHNOLOGY AND APPLICATIONS”
during 4th February - 3rd March 2015

Detailed information is made available for both the training in NIWE websites

- Mr. Karthik R visited Space Application Centre, (SAC, ISRO) Ahmedabad from 26th to 28th November 2014 and had discussions regarding satellite data products & resource maps with Dr. Bhimal Bhattacharya.
- Mr. Karthik R & Dr. G. Giridhar visited GIZ, New Delhi on 9th December 2014 to discuss the times lines and methodologies on assessment of Satellite data and preparation of Solar Atlas. It is now proposed to bring out first map of Solar Atlas by 31st March, 2015.
- SRRA has entered into a program under PPP mode to meet the solar industry requirements with 3 firms on development of HR and capacity building at various levels.

Training Program Conducted by SRRA:

- One day workshop on “Solar Resource Assessment and Solar Project Development” held at NIWE Chennai jointly with U.S. Department of Energy (DoE) /NREL on 12th November 2014.

New Infrastructure created/proposed

- SRRA successfully established following facilities at Prathyusha Institute of Technology and Management (PITAM), Thiruvallur.
 1. SRRA station.
 2. Advanced Measurement Station (AMS).
 3. Calibration laboratory,
- NIWETAM Hall, an exclusive hall for NIWE to conduct Training Program, R&D activities etc.



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

Dr. S. Gomathinayagam, Director General

- Industry Institute Partnership Council Meeting (IIPC) at GKM College of Engineering and Technology on 14th October 2014.

- Standing Committee on Energy Meeting on – “Need for long term Renewable Energy Policy and Legal Reforms” on 16th October 2014.
- Small Wind Turbine Manufacturers Meeting at NIWE, Chennai on 28th October 2014.
- Committee Meeting to address the issues related to implementation of SWES progress on 29th October 2014.
- First Meeting of the Expert Committee to Study various RE Laws at MNRE, New Delhi on 7th November 2014.
- Inaugurated & delivered the address on SRRA Station Advanced Measurement Station Calibration Laboratory at Prathyusha Institute of Technology and Management on 11th November 2014.
- Consultative Committee Meeting for Ministry of Power and MNRE at Parliament House, New Delhi on 18th November 2014.
- 3rd Fraunhofer Innovation and Technology Platform- “Powering a Greener Future” Conference at Bengaluru during 21st & 22nd November 2014.
- 2nd Governing Council Meeting of NISE, New Delhi on 25th November 2014.
- Visited Loyola College for Energy Project Co-operation on 27th November 2014.

R & D Team

- Finalisation of proposal for “Design and development of Dynamometer explicit test facility for generator of small wind energy systems up to 10 kW” at CSIO, Chennai on 10th October 2014.
- Meeting in connection with USAID at TEDA, Chennai.
- Meeting with Mr. Marrisamy on his “New Invention of AC current” at WTRS, Kayathar
- Stakeholders Small Wind Turbine Manufacture meeting on 28th October 2014.
- Committee meeting for proposing Road Map for promoting SWES in India on 29th October 2014.
- NABL re-certification audit pertaining to ISO/IEC 17025:2005 at WTRS, Kayathar during 1st to 2nd December 2014.
- Town Official Language Meeting (TOLIC) meeting at Chennai on 21st November 2014.

K. Boopathi, Additional Director & Head, WRA

- Meeting with GIS's Appraisal Mission on Green Energy Corridors (GEC) at New Delhi on 30th October 2014.
- Lecture delivered on Wind Resource Assessment Techniques at PSG college of Engineering, Coimbatore on 31st October 2014.
- Prebid meeting for Southern Railways, Chennai on 21st November 2014.

- Presentation about the activities of NIWE on special focus on "FOWIND" for European Union Delegation of Ambassadors at Hotel Leela Palace, Chennai on 8th December 2014.

A.G.Rangaraj, Assistant Director (Technical), WRA

- Lecture delivered on "Wind Data Collection in India & Resources assessment of NIWE" to IREDA officials at New Delhi on 17th October 2014.
- Lecture delivered on "Wind Turbine Technology" at National Institute of Technical Teachers Training and Research (NITTTR), Chennai on 30th October 2014.
- Project Kick Off meeting for M/s.Oil India Limited, Noida at Guwahati, Assam on 2nd December. 2014.

J.Bastin, Assistant Director (Technical), WRA

- Discussion with the scientists regarding procurement of LULC data at NRSC, Hyderabad on 16th October 2014.
- Lecture delivered on Wind Resource Assessment Techniques at PSG college of Engineering, Coimbatore on 31st October 2014.

Wind Turbine Testing Team

- Ninth Management Review Meeting for ISO/IEC 17025-2005 at NIWE, Chennai on 5th November, 2014.
- Re-accreditation audit ISO/IEC 17025-2005 at WTTS, Kayathar during 1st to 2nd December, 2014 at WTTS, Kayathar.

Mohammed Hussain, Director & Head, WTRS

- Lecture delivered on "Recent Development in Renewable Energy – special reference to Wind Energy" in "National Level Technical Symposium" at V.V. College of Engineering, Tisaiyanvilai, Tirunelveli Dist. T.N. on 9th October 2014.

P. Kanagavel, Additional Director & Head, ITCS

Lecture delivered on "Importance of Wind Energy" organized by MTS Academy at Sri Karpagambal Higher Secondary School, Mylapore, Chennai on 13th December 2014.

M.Anvar Ali, Additional Director & Head, ESD

- Committee meeting for new invention of "AC current generation without any consumption of diesel" at Kayathar on 8th October 2014.

Dr.G. Giridhar, Director & Head, SRRA

- Lecture delivered on "Solar Radiation Measurements in India, and activities of NIWE" to IREDA officials at New Delhi on 19th September 2014.

- Standing Committee on Energy to discuss Demand for Grants 2014-15 at Parliament House, New Delhi on 23rd September 2014.
- Discussion on making Wind and Solar Atlas with the technical help from NRSC at NRSC Hyderabad on 16th October 2014.
- NRSC Meeting in MNRE, New Delhi on 10th November 2014.
- U.S. Department of Energy (DoE)/National Renewable Energy Laboratory (NREL) discussed on the SRRA activities in India at NIWE on 11th November 2014.
- Lecture delivered on "Solar Radiation and weather monitoring" in the NCPRE course Solar PV Modules and systems training and characterization IIT, Bombay on 27th November 2014.
- Discussion about SRRA project Phase I, II & III and establishment of NISE calibration laboratory with MNRE, NISE & SECI officials at New Delhi on 8th December 2014.

R. Karthik, Assistant Director (Technical) Contract

- Lecture delivered on "Solar Radiation Resource Assessment and Solar PV & CSP Technologies at Coimbatore Institute of Technology, Coimbatore on 21st November 2014.

Peer Review Meeting

- All NIWE staff attended Peer Review Committee Meeting on review of the activities of NIWE covering the period 2009 to 2014 at NIWE, Chennai on 15th November 2014.

Visits Abroad

Dr. S. Gomathinayagam, Director General attended the Expert Group Meeting on Renewable Energy Resource Assessment for Countries in the Asia-Pacific Region at Bangkok, Thailand during 25th and 26th September 2014.

S.A. Mathew, Additional Director & Head presented a scientific paper entitled "Wake Effects of Wind Turbines and its impacts on Power Curve Measurements" in the ICSREE 2014: XII International Conference on Sustainable and Renewable Energy Engineering in Dubai, UAE during 18th – 19th October 2014.

A. Senthil Kumar, Additional Director & Head, S&C participated in the IECRE Management Committee (REMC) and Forum meeting - Wind Energy held at Boulder, Colorado, USA.

Publications

- Marko Schwandt, Kaushal Chhatbar, Richard Meyer, Katharina Fross, Indradip Mitra, Ramadhan Vashistha, Godugunur Giridhar, S. Gomathinayagam & Ashvini Kumar, "Development and Test of gap filling procedures for Solar Radiation data of the Indian SRRA measurement network", Energy Procedia 57(2014) PP 1100-1109.
- Marko Schwandt, Kaushal Chhatbar, Richard Meyer, Indradip Mitra, Ramadhan Vashistha, Godugunur Giridhar, S. Gomathinayagam & Ashvini Kumar, "Quality check procedures and statistics for the Indian SRRA solar radiation measurement network", Energy Procedia 57(2014) PP 1227-1236.
- A.Kumar, S. Gomathinayagam, G. Giridhar, I. Mitra, R. Vashistha, R. Meyer, M. Schwandt & K. Chhatbar, "Field experiences with the operation of solar radiation resource assessment stations in India", Energy Procedia 49(2014) PP 2351-2361.
- K. Navin Sam, N. Kumaresan, N. Ammasai Gounden and Rajesh Katyal, "Analysis and Control of Wind-Driven Stand-Alone Doubly-Fed Induction Generator with Reactive Power Support from Stator and Rotor Side", Wind Engineering, Volume 39, No.1, 2015, pp 97-112.
- M. Joel Franklin Asaria, G.Arivukkodi, K. Boopathi & S. Gomathinayagam, "Wind Energy - A Potential Resource for a Sustainable Future", International Conference on "Emerging Environmental & Oxidation Technologies for Energy Environment and Sustainability".

Training / Conferences / Seminars attended by NIWE Scientists

Bladed Software Training

Dr.S.Gomathinayagam, Rajesh Katyal, J.C. David Solomon, Deepa Kurup, R. Naveen Muthu, K. Boopathi, A.G. Rangaraj, J. Bastin, M.C. Lavanya, & G. Arivukkodi, S.A. Mathew, M. Saravanan, Bhukya Ramdas, A.R. Hasan Ali & A. Senthil Kumar have attended the 5 days training on "Bladed Software" conducted by DNV & GL Experts from Europe organized at NIWE, Chennai, during 15th to 19th December 2014.

Laboratory Quality Management System & Internal Audit as per ISO/IEC 17025:2005 Training

Rajesh Katyal, S.A. Mathew & A. Senthil Kumar attended a training on "Laboratory Quality Management System & Internal Audit as per ISO/IEC 17025:2005 organised by Bureau of Indian Standards (BIS) / National Institute of Training and Standardisation (NITS) at Noida during 9th – 12th December 2014.

K. Boopathi, Additional Director & Head, WRA &

P. Kanagavel, Additional Director & Head, ITCS

- Attended a training "Communication And Presentation Skills" organized by the Institute of Management Training & Research (IMTR), Goa at Goa during 13th to 16th October 2014.

M. Joel Franklin Asaria, Additional Director, WRA &

M. Anvar Ali, Additional Director & Head, ESD

- Attended training on "Energy Management" at IIT, Mumbai during 24th to 28th November 2014.

M. Joel Franklin Asaria, Additional Director, WRA &

G.Arivukkodi, Assistant Engineer, WRA

- Attended International Conference on "Emerging Environmental & Oxidation Technologies for Energy Environment and Sustainability" at Anna University, Chennai during 29th to 30th September 2014.

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

- Attended one day workshop on "Solar Resource Assessment & Solar Project Development" jointly with NREL, DoE and MNRE at NIWE, Chennai on 12th November, 2014.

WTT Team

- Attended the "Safety & Rescue Training" both theoretical and practical training provided by M/s. Safecorp Safety Services Private Limited at WTTS, Kayathar during 6th to 7th November, 2014.
- M. Karuppuchamy and A. R. Hasan Ali attended the training program on "Laboratory quality system, management & internal audit as per IS/ISO 17025" organized by Bureau of Indian Standards (BIS) at Hyderabad on 11th to 14th November, 2014.

S&C Engineers

- 5th International Congress on Computational Mechanics and Simulation organized by CSIR – SERC, Chennai & IndCAM, Mumbai held at SERC, Chennai during 10th to 12th December 2014.

C.Stephen Jeremias, Assistant Engineer, ESD

- Workshop on "National knowledge networks (NKN)", at IIT- during 15th to 17th December 2014.

Prasun Kumar Das, Assistant Director (Technical) Contract

- Two day workshop on "Solar Resource Assessment" in NISE organized by NREL & NISE at Gurgoan during 20th to 21st November 2014.

T.Ganeshamoorthi, Joint Executive Assistant

- Attended Excel Training in Macros on 15th December 2014.

**The following NIWE staff delivered lecture(s) in Training Course on
“Wind Resource Assessment and Wind Energy Technology” held during 10th to 18th November 2014**

S.No.	Topic	Speaker
1	History of Wind Energy Conversion Technology and Power Generation	Dr. S. Gomathinayagam
2	Wind Energy Development in India	Shri. P. Kanagavel
3	Wind Resource Assessment & Techniques	Shri. K. Boopathi
4	Wind Measurement and Instrumentation	Shri. A.G. Rangaraj
5	Software Tools for Wind Resource Assessment	Ms. M. C. Lavanya
6	Wind Data Measurements and Analysis	Ms.G.Arivukkodi
7	Overview of Wind Turbine Components	Shri. N. Rajkumar
8	Wind Turbine Generators	Shri. M. Anwar Ali
9	Small wind turbine and Hybrid system	Shri. J.C. David Solomon
10	Micrositing of Wind Farm & Issues	Shri. J. Bastin & Shri B. Krishnan
11	Offshore Wind Energy - An overview	Shri. M. Joel Franklin Asaria
12	Solar Radiation Resource Assessment	Dr. G. Girdhar, Director
13	Solar Photovoltaics Technology – An Overview	Shri. Prasun Kumar Das

**The following NIWE staff delivered lecture(s) in the 12th International Training Programme on
“Wind Turbine Technology & Applications” held during 19th November to 12th December 2014**

S.No.	Topic	Speaker
1	- Introduction and Status of Wind Energy Technology - Wind Turbine Tower	Dr. S. Gomathinayagam
2	- Role of NIWE in Indian Wind Energy Development - Wind Energy Development in India - Environmental Aspects of Wind Turbine Technology	Shri. P. Kanagavel
3	- Overview of Wind Turbine Components - Wind Resource Assessment and Techniques - Design and Layout of Wind Farms	Shri. K. Boopathi
4	- Role of Non Crimp fabric in Blade Manufacturing - Offshore Wind Energy: An Overview	Shri. Joel Franklin Asaria
5	- Wind Turbine Gear Box - Wind Turbine Generators	Shri. N. Raj Kumar
5	Wind Turbine Generators	Shri. M. Anvar Ali
7	Control and Protection System in Wind Turbine	Shri. S. Arulselvan
8	- Wind Turbine Foundation - Small Wind Turbine Testing and Hybrid Systems	Shri. Rajesh Katyal
9	- Guidelines for Wind Measurements - Indian Wind Atlas : A Case Study	Shri. A.G. Rangaraj
10	Wind Measurement and Instrumentation	Shri. J. Bastin
11	Wind Measurements by Remote Sensing Instruments	Shri. B. Krishnan
12	Wind Data Measurements and Analysis	Smt. M. C. Lavanya
13	Type Certification of wind turbine and overview of Design Requirements as per IEC 61400 – 1	Smt. G. Arivukkodi
14	Wind Turbine Testing & Measurement Techniques	Shri. A. Senthil Kumar
15	Power Curve Measurements	Shri. S. A. Mathew
16	Instrumentation for Wind Turbine Testing	Shri. M. Saravanan
17	Safety and Function Testing	Shri. M. Saravanan
18	Safety and Function Testing	Shri. Bhukya Ram Das
19	Grid Integration of Wind Turbine	Smt. Deepa Kurup
19	- Indian Government Policies and Schemes - Overview of Testing & R&D facilities at WTTS/WTRS, Kayathar	Shri. Mohammed Hussain
20	Solar Radiation Resource Assessment	Shri. Prasun Kumar Das

VISITOR AT NIWE

Ms. Varsha Joshi, IAS, Joint Secretary (Wind Energy), MNRE has visited NIWE on 17th October 2014 and given inspiring address to NIWE Staff members. The Director General explained all the activities and services of NIWE apart from showcasing the campus facilities. She also inaugurated the interdisciplinary work group facility at NIWE covering four major thrust areas of Aeromechanical design, Wind resource / farm planning assessment, Electrical / Electronics with Grid quality power and computational analysis and simulation.



HINDI FORTNIGHT 2014

Hindi Fortnight 2014 was celebrated in National Institute of Wind Energy (NIWE) Chennai during 15th to 30th September 2014. 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-2014 message of Shri. Piyush Goyal, Honorable Union Minister of New and Renewable Energy (MNRE), Government of India. 174 participants took part in the competitions. Valedictory function was conducted on 9th October 2014, the prizes were distributed to the winners by Dr. S. Gomathinayagam, Director General, NIWE.



Repowering of Wind Farms : Issues and Proposals in India

Dr. S. Gomathinayagam, Director General, National Institute of Wind Energy E-mail : dg.niwe@gov.in

India has entered in the wind energy sector in the mid eighties and the technology of wind turbine generators available at that time has been with 30-40m tall turbine towers and rotor diameters in the range of 20 to 30 m involving WTGs of 55 to 400kW capacities. The required machines were many per MW installation and the needed land was 10 to 12 acres unobstructed, based on the spacing between wind turbines as 5D x 7D, where 5D is the distance within a row between adjacent wind turbines and 7D is the distance between two rows of wind turbines with "D" as Diameter of the Rotor in meters. Except for a small fraction of investment by Government of India in the demonstration wind farms, the entire investment in the wind industry has been from private investors owing to the then policy of accelerated depreciation to the extent of 80 to 100%, in the very first year of investment in wind energy. Over the three decades of operation of these small capacity machines there has been considerable area of land occupied having best windy conditions, producing low generation or even no-generation of wind power. The high technology WTGs with multi mega watt capacities, if they are deployed in these best sites by partially or fully replacing the old ones, would promise excellent new capacity addition apart from several fold increase in energy generated from WTGs.



Foot Print or entire land ownership in wind farms has different issues for repowering

The process of transforming the old WTGs to new state-of-the-art WTGs is the repowering, which needs a policy to attract the older owner/investors to reinvest in wind power, or attract new investors to repower older WTGs/Wind farms. The possible issues and solutions in the form of proposals are discussed in this feature article. Wind farm repowering need not be only from that of addition of new WTGs but also with solar PV or any other renewable form of energy including even energy storage systems.

Denmark and Germany and USA who were pioneers in installing Wind Turbines quite early, ahead of many countries have already repowered many old wind farms with short-term policies to attract the investors. Repowering as of now is quite slow in most countries. A study in USA points that the repowering market will be hundreds of MWs till 2020 and may go to 1-3 GWs beyond 2020 as the expected life of Wind Turbines are usually in the range of 20-25 years. A study in Ireland points out that almost 90% of the Wind Turbines installed onshore before 2020 would be repowered by 2050. However, it is more than evident that with ever increasing rotor diameter and hub height of wind turbines ensuring higher energy production in the same site, repowering is an ongoing potentially growing business in the Wind Energy sector all over the world.

Indian Status

Several studies have been carried out in India and it is estimated that over 25% of the turbines in India have rating below 500 kW which is the indicative scope for repowering in India. A fraction of those machines which were installed till 1997 will amount to 686 MWs with 2663 turbines. After 1997 the additional numbers of WTGs (less than 500 kW) are 2572 with a total capacity of 694 MW. Considering only WTGs which have crossed beyond 15 years of operation in India there is very huge potential for repowering in India. Tamil Nadu which has already the highest wind installed capacity accounts for most of the repowering

capacity having one of the best favorable wind conditions in India. The advantages of higher annual energy generation and meeting of NAPCC targets of renewable power deployment and the extent of CO₂ reduction would certainly outweigh the challenges and hence needs a clearly defined policy support for repowering.



Existing Wind farm (6.25MW, PLF 14.3%)



Repowered Wind farm (10MW, PLF 21.7%)

A typical case study carried out by WRA team of NIWE by K.Boopathy brings out an installed capacity increase of over 60% with energy increase in the range of 52 to 57 % based on a “WindSim” and “Wasp” application softwares

Issues :

(i) Financially the challenges are compounded by the need for decommissioning of old turbines involving heavy machinery and removal of the same from site, grid capacity enhancement and loss of generation from the old wind turbines

which have residual life.

(ii) Single Wind Turbine Repowering:

There are several single wind mill owners in India due to the AD-based investors/developers. An individual requiring repowering of a single WTG at the same location needs to obtain clearance from the consenting Authority from the State/Centre with regards to the effect of such repowering to the neighboring wind turbines/wind farms. While replacement of same capacity WTG of modern technology would mean not a great increase in Annual Energy Production (AEP), use of higher capacity instead would need policy for intercropping.

(iii) Multi-Owner Wind Farm Co-operative for Repowering:

A group of WTG owners can join and form a wind farm co-operative and request for permission to repower together with the concerned State or Central Authority so that a large area will be repowered and the profits would be shared on the basis of individual investments in the co-operative.

(iv) Wind farm (more than 2 WTGs) repowering with single or multiple ownership of WTGs/land:

There are cases where the land ownership is based on foot-print basis for the WTG and hence the ownership of land and WTG are likely to be different in a given wind farm. This is also possible in the case of IPPs (Independent Power Producers) repowering a cluster of WTGs in a particular Region. It is assumed this case of repowering would involve complete removal of all the old wind turbines, grid capacity enhancements and repowering with higher capacity WTGs, involving appropriate scientific micro-siting.

(v) Distribution companies repowering old/non-performing wind turbines :

High reliability and grid stability is of primary concern for distribution companies (mostly State or Central owned) which need low PLF (WTGs with low Capacity Utilization Factors-CUF) generators to be decommissioned at a point of

time thus can invite the old investors to participate in repowering of their WTGs with one time additional financial incentives to facilitate the best use of high windy sites. This would also envisage complete removal of WTGs beyond 20-25 years from the operating GRID and replacing with modern high performance WTGs.

- (vi) The fore-closure of PPA and to have a new PPA for the repowered WTGs and consequential deemed loss compensation.
- (vii) Issue of Double payment of infrastructure development Charges (IDC) in some of the states.
- (viii) Spare capacity availability in the grid for power evacuation with higher capacity repowered wind farms.
- (ix) An AD based wind farm developer, the land value would have increased manifold, and a break even of capital investment would have been financially closed. To attract such an investor to repower needs lot of policy push and political and societal will
- (x) As the energy price cost/kWh has been always increasing a captive user would be reluctant to reinvest unless his business demands of energy is increasing.
- (xi) Wind power is highly seasonal and in India it's only for 5 months, the evacuation capacity is a dead investment for almost 7 months in a year. This may bring up issues of evacuating other renewable power with the same grid infrastructure.

Proposals:

- (i) The regulatory requirement of consenting the repowering project proposals such as turbine and land ownership, PPAs and the influence of micro-siting of new wind turbines on the neighboring wind farms and WTGs.
- (ii) It is suggested that the spacing of wind turbines, generally practiced as 5Dx7D, as discussed earlier needs to be waived in repowered WTGs cases on the justification that the new wind turbine is much taller and is "inter croppable" within the old wind farms with a win-win situation.

(iii) If all the WTGs in the Region could not form in the group it would amount to having both older WTGs as well as new repowered WTGs which needs suitable agreement and generation loss (wake loss) compensation for the retained old WTGs in the Region. Criteria could be obtained through scientific field & simulation experiments.

- (iv) Based on limited studies by IREDA, CECL-Bhopal, WISE-Pune & C-WET and experience of some of the Indian Wind Turbine Companies, the suggested promotional measures are based on the possible repowering ratio (repowered installed capacity/existing installed capacity) and the uncertainties of field level micro-siting in contrast to the generally practiced spacing (5Dx7D or 3Dx5D and so on) of wind turbines by various State Regulatory Authorities. A study indicates that, for a range of repowering ratios from 1.2 to 3.2 in various projects in India the effect of changing spacing of 5Dx7D to 3Dx5D results in an increased total generation of electricity to the extent of 70% to 130% for a typical increase in capital cost of repowering in the range of 3% to 8% per kWh generated. In suggesting the promotional measures, the following observations are recorded which form the basis for justification.

(v) Eligibility for repowering:

A cut off date for WTGs operational life should not be preferred for repowering as the machines are fairly new and have more than 50% of their residual design life of 20 years. Instead an annual average capacity utilization factor (20% or less) may be the criteria for encouraging repowering.

(vi) Limiting Repowering Ratios:

World Wide Repowering ratios have been in the range of 1 to 6.4 in specific projects repowered so far. In India, the installed capacity to be repowered cannot exceed 5 times the existing installed capacity or maximum available evacuation capacity at the site whichever is lower. The above will be applicable both for single wind turbines replaced or a cluster of wind turbines (wind farm) repowered.

(vii) Evacuation Enhancement:

If the repowering is not more than 40% of the installed capacity (repowering ratio < 1.4) the

existing evacuation infrastructure may be utilized without any additional cost of Infrastructure Development Charges (IDC). However, while planning the repowering project a thorough load flow analysis at the site may be carried out and recorded. For cases where repowering ratio is beyond 40% needing additional evacuation infrastructure to be ensured for the project to take-off, such expenses borne by the repowerer may be reimbursed from National Clean Energy Fund or specially created Green Energy Fund from all tax payers. This would mean complete waiver of Infrastructure Development Charges (IDC), for repowering projects.

(viii) Accelerated Depreciation:

In view of the proven nature of bankability of wind power in the existing sites, and due to the ready availability of land with high cost at the best windy sites accelerated depreciation benefits may be extended for all repowering projects wherever the tax holiday of 10 years for wind energy production has been completed.

(ix) The State regulatory authorities may adopt scientific micro-siting for each site on a case by case basis without strictly following standard spacing of wind turbines for the repowering projects as the site is already proven and the owner is already willing to proceed with repowering.

(x) Permission of Inter-cropping:

To allow partial repowering in a wind farm or in a windy site inter-cropping of taller WTGs whose heights are more than double that of average tower heights of old WTGs having shorter towers would be permitted.

(xi) Enhanced GBI & REC for repowering:

To account for the increased cost of repowering and to attract old wind farm developers who have

already availed accelerated depreciation and having wind farms with low or no performance but with highly appreciated land value, it is suggested that the additional cost per MW of repowering (decommissioning, grid enhancement & loss of revenue from old WTGs) be compensated with suitable increase in GBI as well as additional RECs per MWh.

(xii) Multipurpose repowering projects to evacuate renewable power from solar as well, when wind power is not available. When wind and solar power at a location is co-existing then smart grid management techniques should be encouraged with low interest financing for hybrid repowering.

(xiii) A hybrid tariff policy for effective utilization of wind farm land where repowering is done with solar PV plants.

(xiv) In the case of foot-print based ownership of WTGs an enabling act may be required to facilitate 'right of way' and enter upon permissions for access to WTG site by neighbourhood land owners for seamless operation and maintenance of WTGs.

In summary, repowering the old WTGs, old non performing wind farms, is a need of the hour as the best windy sites house very low CUF operation of wind farms. Socio-economic, financial, geo-political, techno-economic and regulatory issues are quite complicated for repowering wind farms with newer WTGs or additional solar PVs. For long term sustainability, repowering should steadily be providing the needed larger energy mix of Renewable power in India's Energy Mix. The author welcomes critical remarks and suggestions for providing a well laid out workable scheme for repowering renewables in a big way, specially with wind, solar and hydel resources.



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Velachery - Tambaram Main Road, Pallikaranai, Chennai - 600 100.

Phone : +91-44-2246 3982, 2246 3983, 2246 3984 Fax : +91-44-2246 3980

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