

EDITORIAL



Significant mile stones in NIWE mark this quarter's progress.

International Accredited Certification has been launched in India in collaboration with TUV Rheinland, GmbH & M/s TUV Rheinland India and NIWE on

8th May, 2015 as part of the RE-INVEST-2015 as suggested by the Hon'ble Minister of State (IC) for Power, Coal, New & Renewable Energy.

Higher wind penetration in the electricity mix in India has been causing several DISCOMs serious issues, like grid frequency management, electricity generation and distribution planning. Certain States which have excellent wind resource such as Tamil Nadu, have been reluctant to allow new capacity addition in the wind energy sector owing to the infirm nature of wind power in the electricity grid. It is a proud moment for NIWE with the coordinated efforts of Vortex Spain and NIWE with dedicated efforts of Joint Secretary, (Wind Energy) Ms. Varsha Joshi in bringing out the synergy between TANGEDCO, IWPA with NIWE's wind power forecasting capability to launch business model real time forecasting of wind power in all 120 sub stations of Tamil Nadu, giving visibility to the State Load Dispatch Centre.

Another major mile stone reached by NIWE is the completion of SolMap project of GIZ, Germany, along with NIWE and launching of high resolution 'on line GIS based Indian Solar Resource Atlas' for all the 3 radiation viz. Direct, Global and Diffused (DNI, GHI, DHI). The released atlas has a spatial resolution of 3km, spanning the entire India and it is well tuned with real time measurements with 121 Solar Radiation Resource Assessment Stations spread across India with a possibility of risk quantification on the resource values at each grid point.

NIWE also extended the Global Wind Day celebrations as usual on 15th June this year with WWF, India (World Wild Fund for Nature) involving school children.

While the Wind Turbine manufacturers are slowly picking up business against the stiff competition from the Solar developers, there has been a

gradual increase in installed capacity which has already made India to move towards the 4th position from its 5th position in global installed capacity of wind turbines, overtaking Spain.

A new innovative small wind turbine system has been taken up for testing at Kayathar first of its kind of the vertical axis type, a 15 kW grid connected wind turbine indigenously manufactured in India. The techno-economic analysis of small wind energy hybrid system application to powering telecom towers has been completed.

A MoU for first offshore wind power project 'FOWIND' has been signed, with EU Consortium.

Verification of wind monitoring for 23 sites and Wind Resource Assessment projects covering various aspects for about 115 MW have been completed. Over 51 stations with 100 meter wind resource measurements have been completed with one year continuous measured data. Wind power forecasting providing visibility on 15 minutes / one hour / 3 days / week ahead has been facilitated and launched real time on line as a case study for Tamil Nadu.

3 Wind Turbine's have been instrumented and measurements are going in one of the wind turbines, as part of International quality type testing.

Campus infrastructure and captive power generation is building up, video conferencing facility and enhancing the solar photovoltaic power plant on the rooftop are a few areas for NIWE's Chennai campus in which work is in progress.

Our Scientists have presented several papers in India & Abroad during this period.

We value your constructive criticism and fruitful suggestions for effective cooperation with our new Knowledge Sharing and Management Division and enable NIWE take up Industry relevant research / consultancy projects for mutual benefit. In this regard your valued suggestions are welcome to "Make in India" with 'zero defect and zero effect' as envisaged by our Hon'ble Prime Minister.

Dr. S. Gomathinayagam, Director General

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Offshore, Small Wind Hybrid System & Industrial Business

Testing of Small Wind Turbine

NIWE has presently undertaken testing of two small wind turbines, namely a 15 kW grid-connected vertical axis wind turbine (VAATA Smart), which has been indigenously manufactured by a Chennai based company and the other with horizontal axis wind turbine of 4.5 kW capacity indigenously manufactured by a Pune based company, at WTRS, Kayathar during the ensuing windy season. With this a total of five numbers of type testing of models ranging from 650 W to 15 kW is in progress.



Vertical Axis Small Wind Turbine installed at WTRS for testing

Performance evaluation of small wind turbines deployed for telecom application

MNRE is exploring ways to harness the untapped potential of renewable sources of energy for telecom applications and also identify the niche areas that will bring this technology to the forefront in meeting the energy demands at affordable costs. To strengthen the concept of installing small wind turbines on telecom towers and to encourage a

significant deployment initiative to such markets, a team deputed from NIWE visited sites where SWTs were installed on telecom towers in Jaisalmer District, Rajasthan and submitted a detailed report on performance of these systems.

Techno-Economic Analysis of the scheme and diagnostic to study of small wind energy and hybrid systems

NIWE has prepared a report on Techno-Economic Analysis and diagnostic to study of small wind energy and hybrid system with an objective to evaluate the performance of the existing small wind energy hybrid systems installed in selected States namely Maharashtra and Goa.



SWT installed on Telecom tower

The outcome of the study will be useful in understanding the overall economics and the cost benefit of these systems. It is envisaged as essential and necessary that net metering and feed in tariffs need to be introduced for small wind turbines and solar hybrid systems in line with that has been done for the rooftop SPV systems, in a few States in India.

Memorandum of Understanding

A generic MoU has been signed between NIWE and St. Peter's Institute of Higher Education (St. Peter's University) on 15th June 2015 for the purpose of academic and research interaction in the area of renewable energy.

FOWIND – MoU by CSTEP, GWEC and NIWE

A Memorandum of Understanding (MoU) has been inked on 15.06.2015 between CSTEP, GWEC and NIWE for facilitating the development of offshore wind farm project in the country. As part of the MoU, CSTEP on behalf of FOWIND project consortium intends to transfer the ownership of LIDAR to NIWE for undertaking the real time wind resource measurement in the Gujarat Coast. The wind resource measurements using LIDAR will act as useful pointers for development of offshore project, which will be first of its kind in the country.



Wind Resource Assessment

During the period of April to June 2015, 6 new wind monitoring stations has been established (3 in Meghalaya, 2 in Tripura & 1 in Madhya Pradesh) and 7 wind monitoring stations have been closed down (3 in Manipur, 2 in Arunachal Pradesh, 1 in Assam & 1 in Odisha). Presently, 107 wind-monitoring stations are operational in 14 States and 1 Union Territory under various wind monitoring projects funded by the Ministry of New and Renewable Energy (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 23 sites.
- Technical Due Diligence for the proposed 68 MW wind farm.
- Performance Guarantee test of 49.5 MW wind farm.
- Repowering / intercropping of existing wind farm for 1 site.
- Report on WRA in uncovered / new areas for 3 years.

R&D Projects in progress

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

GVP has designed and developed a photonic system and the same is being validated with the 120 m met mast and other remote sensing instruments results. Validated the model designed by GVP at Kayathar by NIWE scientists. The preliminary prototype of the model has been developed. The field evaluation of the prototype is in progress.

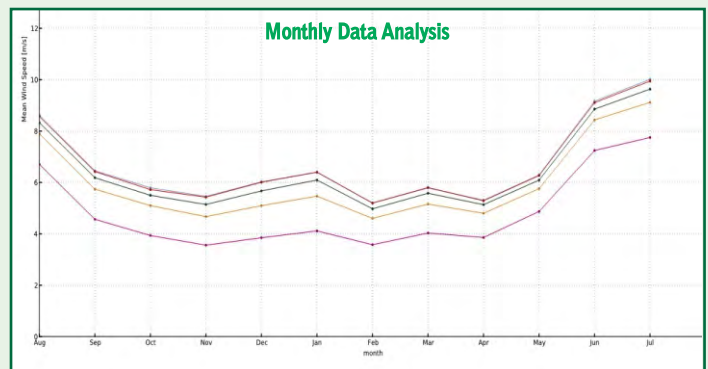
Repowering of Existing Wind Farms in Tamil Nadu

Collection of required wind turbines related information in Tamil Nadu at various locations has been carried out. Few analysis of the wind farms have been completed, for possible repowering.

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

NIWE has established 75 number of Wind monitoring stations (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) under the project 'Estimation & Validation of Wind Power Potential at 100 m level in 7 States of India' and the data acquisition is in progress.

- One year continuous data acquisition from 51 number of WMS (8 in Andhra Pradesh, 7 in Gujarat, 2 in Madhya Pradesh, 4 in Maharashtra, 11 in Karnataka, 8 in Rajasthan and 11 in Tamil Nadu) has been completed successfully.



- Continuously monitoring and receiving real time wind data from 73 stations in 7 States.
- Monthly Data Analysis, Verification and preparation of Interim reports are in progress.

Wind Resource Assessment Studies

- Chip collection, Chip data downloading & processing and Monthly Data analysis for M/s. NTPC, M/s. Ennore Port, M/s. Gangavaram Port Trust, M/s. NSL, M/s. Doon University and M/s. ANERT have been carried out.
- Interim report for Gangavaram Port Trust has been sent.
- Draft report for 2 sites in Kerala for M/s. ANERT has been submitted.
- Site inspection of Kudgi site for M/s. NTPC has been carried out.
- Closedown of Lakshmanpur site for M/s. THDC has been carried out.

Other Programmes

- J. Bastin, Assistant Director (Technical) visited Amrapur site, Gujarat in connection with bid evaluation project for M/s. THDC Limited during 6th to 8th April 2015.
- K. Boopathi, Additional Director & Head visited Dhanushkodi, Rameshwaram for discussion with officials for extension of lease period during 16th to 18th April 2015.
- A.G. Rangaraj, Assistant Director had discussion with M/s. GEDA and M/s. GEDCO officials in connection with wind power forecasting during 30th April to 2nd May 2015 at Vadodara, Gujarat.

- M. Joel Franklin Asaria, Additional Director visited Andaman for discussion with Secretary, Energy on Renewable for Andaman & Nicobar during 27th to 29th April 2015.
- K. Boopathi & A.G. Rangaraj had visited Gamesa manufacturing unit on 8th May 2015 in connection with Wind Generation data for forecasting.
- K. Boopathi had discussion on Wind Power potential with Power Secretary, Odisha at Bhubaneswar, Odisha during 5th & 6th June 2015.
- K. Boopathi visited Tagore Engineering College, Chennai to provide Technical support for their DST project on 30th June 2015.

Launch of Wind Power Forecasting Services in India

Wind energy is one of the fastest growing renewable energy. But it is an intermittent source. Since the wind speed is fluctuating, the output of a wind plant also fluctuates. The intermittency is the biggest challenge in integrating wind power into the electric grid. Though we are connecting this power to the grid, due to fluctuation and unpredictable nature of wind leads to loss of billions of units of electricity. The fluctuations creates costs for the electricity system and consumers as well as potential risks to the reliability of electricity supply. To mitigate this issue, one approach is forecasting future values of wind power production.

“A wind power forecasting is an estimation of the anticipated production from wind turbine / wind farm / wind power pooling stations in the near future”.

Under the Indo-Spanish Joint Research Programme for Technical co-operation in Renewable energy, NIWE has collaboration with M/s. Vortex Factoria de Calculs, S.L., Spain with the objective to propose a holistic approach for forecasting wind and wind power from an installed capacity of more than 7000 MW of wind energy in Tamil Nadu as the ultimate deliverable to support the scheduling and dispatching process of electricity from these wind farms. Under this programme, NIWE has been developing capacity

building in wind power forecasting after rigorous exercise in forecasting including providing operating forecasting as per Indian Electricity Grid Code (IEGC) norms in SCADA connected wind forecasting. Now, NIWE is capable of offering the services to any wind farm operator / wind power aggregator / Wind power pooling station including private and state owned substations to provide clear visibility on 15 minutes / 1 hour / 3 days / week ahead wind power forecasting based on scientific relational study updates, model simulation with high performance computing per location / cluster of turbines etc.

Wind Power forecasting services was launched by Honorable Joint Secretary Ms.Varsha Joshi I.A.S, MNRE on 13th May 2015 at National Institute of Wind Energy (NIWE), Chennai.



The launch of this service by NIWE will facilitate to provide forecast of wind power from wind farm / substation to support the scheduling and dispatching of electricity from wind power generators to ensure higher level of wind energy evacuation.

This is an important milestone of achievement of the outcome of the discussions held at the RE-INVEST meet held during 15th to 17th February 2015 at New Delhi.

Wind Turbine Testing

- The measurements are expected to start during windy season of 2015 for Type Testing of XYRON 1000 kW wind turbine at Richadewda, Ratlam District, Madhya Pradesh of M/s. Xyron Technologies Limited.
- The measurement at the site is on-going for Type Testing of GVSL 1700 kW wind turbine at Kampaneari Pudhukudi (Village), Tenkasi (Taluka), Tirunelveli (District), Tamil Nadu of M/s. Garuda Vayu Shakti Limited.
- The measurements are expected to start during windy season of 2015 for Power Curve Measurements of INOX 2000 kW wind turbine at Rojmal, Rajkot District, Gujarat.

Standards and Certification

- Co-operation Agreement has been signed among NIWE, M/s. TÜV Rheinland Industrie Service GmbH & M/s. TÜV Rheinland (India) Private Limited in connection with certification of wind turbines. Subsequently, in a Wind Turbine Manufacturers meet held on 08-05-2015 at GRT Grand, T.Nagar, Chennai, NIWE & TÜV Rheinland jointly launched wind turbine Certification services.



- Review / verification of documentation in connection with renewal of certificate of "V39-500 kW with 47m rotor diameter" wind turbine model 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 the various wind turbine manufacturers for more than 50 wind turbine models in connection with Revised List of Models and Manufacturers (RLMM) – Addendum-II List have been completed.

- As a part of RLMM process, Additional Director / Head, S&C and S&C Engineer carried out the verification of the manufacturing facility of two wind turbine manufacturers.
- Organized the RLMM committee meeting.
- Issued RLMM Addendum - II List dated 15.05.2015 to various stakeholders including wind turbine manufacturers, State Electricity Boards, TRANSCOS and State Nodal agencies etc. The RLMM Addendum - II List dated 15.05.2015 is also hosted in NIWE website.
- Prepared consolidated list of wind turbine models and manufacturers marketed in India with Type Certificate as on May 2015 and the same has been hosted in NIWE website, upon approval of DG, NIWE.
- An agreement has been signed with M/s. RRB Energy Limited to take up the project on renewal of Certificate of "Pawan Shakthi-600kW" wind turbine model as per TAPS-2000 (amended). Review / verification of documentation in connection with renewal of Certificate of "Pawan Shakthi-600kW" wind turbine model are initiated.
- Completed review / verification of documentation received for two prototype wind turbine models received from wind turbine manufacturers in connection with installation of prototype wind turbines in India as per MNRE guidelines.
- Organized a committee meeting on Prototype wind turbine models, letters have been issued for grid synchronization of one prototype wind turbine of "Pioneer Wincon 750/49 with 73m tower" wind turbine model of M/s. Pioneer Wincon Private Limited and another prototype wind turbine of "SUZLON S111 DFIG 2.1MW, 50Hz" wind turbine model of M/s. Suzlon Energy Limited.
- S&C Engineer along with MNRE official carried out the joint field inspection at M/s. Owens Corning (India) Private Limited, Taloja, Raigod District, Maharashtra.
- Co-ordination works with Bureau of Indian Standards (BIS) in connection with preparation of draft Indian standards on wind turbines related activities are ongoing.

Visitors

- Mr. Thomas Fuhrmann, CEO & Managing Director, M/s. TUV Rheinland (India) Pvt. Ltd. on 6th May 2015.
- Mr. Benedikt Anselmann, Vice President - Industrial Services, M/s. TUV Rheinland (India) Pvt. Ltd. on 6th May 2015.

- Mr. Karl Friedrich, Head - Certificate body, M/s. TUV Rheinland Industrie Service GmbH on 6th May 2015.
- Mr. Jai Prakash Narayan, Expert - Certification, M/s. TUV Rheinland Industrie Service GmbH on 6th May 2015.

Wind Turbine Research Station

Total Operation and Maintenance works of nine 200 kW MICON Wind Electric Generators and of nine 400V / 11kV Transformers of the WEG's were completed and all the machines are being kept ready for the uninterrupted operation during the windy season 2015 which is expected to start from second week of June 2015.

The visit of 70 students & 6 faculties from Tamil Nadu

Agricultural University, Department of Agriculture Engineering, Coimbatore visited on 30th April 2015. were coordinated and showcased the Small & Large Wind Turbine Testing, R&D and WRA facilities & field exposure intensive demonstration imparted on working of Wind Electric Generators, O&M / Met masts measurements and testing of small aero-generators.

Information, Training and Customized Services

Global Wind Day Celebrations

This year on 15th June, to mark the celebration of Global Wind Day, NIWE celebrated the day in collaboration with World Wide Fund for Nature (WWF) – India.

This year the day celebrated with Science Fair projects for school students and a Workshop on Renewable Sources of Energy for the teachers of participating schools. The theme of the Science Fair was "Renewable Sources of Energy" for the students to build working models and prizes were distributed to the winners.

This year's event engaged over 58 School Children from various parts of the State along with their teachers at NIWE campus and shared basic knowledge about wind and renewable energy. The event started with the welcome by Mr. Kanagavel, Additional Director and Head, ITCS, NIWE followed by the programme brief by Mr. Saravanan, Senior Education Officer, WWF. The district coordinators of Eco-Club, Chennai and National Green Corps, Mr. Rajasekar and Mr. Thangaraj were actively participated the celebration.



Glimpses of Global Wind Day Celebrations

As part of the celebration, a workshop was conducted for the teachers on two topics where Mr. Kanagavel presented about Energy, Environment and its impact and all renewable energy sources with more emphasis on wind energy and Mr. Paneerselvam from the National Centre for Coastal Sustainable Management spoke of the Disastrous Changes in the Climatic Changes in the recent times and its effect on Coastal lines.

Smt. Varsha Joshi, I.A.S., Joint Secretary (Wind Energy), MNRE was the Chief Guest and delivered special address in the celebration and also distributed the prizes to the winners.

WINNERS		
<u>First Prize</u> Daniel Thomas Mat. Hr. Sec. School, Koyambedu 1. Aishwarya. L 2. Gokui. C. N	<u>Second Prize</u> Apex PonVidyashram, Velachery 1. Aswati Harikumar 2. Harshni. V	<u>Third Prize</u> Anantharasu Aided Middle School, Maraiganallur, Vedaraniam 1. Yazhini. R 2. Harish Surya. M
CONSOLATION PRIZES		
Maharishi Vidya Mandir Sr. Sec. School, Chetpet 1. Tharrunkumar. R 2. Sneha. S	Chennai Higher Sec. School, Velachery 1. Deepak. S 2. Muthuprakash. S	Government Girls Higher Secondary School, Ashok Nagar 1. Kalaiaarsi. S 2. Samathamaanaska.S

Participation in the Exhibitions

NIWE stall has been established and disseminated the information about the activities and services of the Centre along the wind energy awareness in the 4th International Wind Conference and Exhibition 4th Edition of International Wind Conference & Exhibition WE20 by 2020 from 21st to 23rd June 2015 at CODISSIA Trade Fair Complex, Coimbatore. The Stall was inaugurated by Shri. Rajesh Lakhoni, Principal Secretary, Energy, Government of Tamil Nadu in presence of Dr. S. Gomathinayagam, Director General, NIWE and Shri. Dilip Nigam, Director, MNRE.



Student visits

During the period from April - June 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.

- 65 students from Aksheyaa College of Engineering on 17th April 2015.
- 93 students from Kola Saraswathi Vaishnav Senior Secondary School, Kilpauk on 18th June 2015.

Engineering Services Division

- **Video conferencing:** The firm for establishment of Video conferencing system with a board room setup has been finalised.
- **380 kVA Diesel Generator and 62.5 kVA Diesel Generator:** Installation of 380 kVA Diesel Generator and 62.5 kVA Diesel Generator, indent has been submitted to Purchase unit, a committee has been formed by DG on 1st January 2015 and committee meeting completed and finalised the tenderer and awaiting for execution of the work.
- **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 awaiting for execution of the work.
- **Increasing the demand from 160 kVA:** Increasing the demand from 160 kVA to 200 kVA. In this connection 0.2 class accuracy CT & PT are urgently required, indent has been submitted for procurement of Current Transformer & Potential Transformer, and work order has been issued to the supplier and awaiting for CT & PT.
- **CPWD civil works:** Proposal has been submitted to CPWD for (i) construction of Entrance Gate and front side Compound wall, work is started from 30th January 2015 and Cost estimate has been received and the initial payment has been paid to CPWD (ii) existing compound wall to extent for the 10' height at NIWE, work is started from 17th May 2015 waiting for cost estimate and (iii) construction of ITCS cabin and construction of new compound wall.
- **Construction of platform and cabin for wind training programme:** Approval has been received on 12th June 2015 and work will be executed from 22nd June 2015.
- **LAN Networking :** Order for restructuring of LAN networking has been awarded and awaiting for execution of work.
- Additional 6 cameras were integrated with the surveillance system.

Visit of Dr. S. P. Shukla, Joint Director, Department of Official Language

Dr. S. P. Shukla, Joint Director (Policy), Ministry of Home Affairs (MHA), Department of Official Language, visited National Institute of Wind Energy (NIWE) on 23rd May, 2015. During his visit NIWE Campus facilities were showcased after briefing about the activities and services of NIWE.

An OLIC meeting was conducted under the Chairmanship of Dr. S. Gomathinayagam, DG, NIWE and Dr. S. P. Shukla, Joint Director (Policy), MHA as an officer on special visit. The OLIC members, scientists and other senior officers of NIWE attended the OLIC meeting. After the OLIC meeting, Dr. S.P. Shukla has done an onsite Inspection of the records of OL Hindi of Hindi Section, NIWE.



Dr. S.P. Shukla with NIWE team while doing onsite Inspection



Dr. S.P. Shukla visiting SRRA Station at NIWE

Knowledge Sharing and Management (KS&M)

NIWE is active in the areas of Resource assessment, Consultancy work, Wind Turbine Testing, Certification and Training. Knowledge & Skills generated in the units make them relevant in ensuring delivery of high-quality services and positive sector growth. To keep the services offered to the stakeholder at cutting edge newer knowledge paths have to be identified and developed.

Sharing of Knowledge paves way to ideation, growth of new concepts & demonstration of feasibility. The new found unit will strive to create and sustain such forms of ideations, conceptualisations and feasibility establishment through interaction with all stakeholder communities primarily with academia and industry. Working on this motto, NIWE works to ensure that information & knowledge finds its way to different units internally at NIWE as well as to external stakeholders to upgrade their capability and in the reversal of knowledge flow net ideas and concepts that can be furthered into business opportunities and establishment of new facilities both for research and revenue generation for NIWE.

As a part of this measure the following activities are being undertaken:

- **Software Work Group.** This facility has been established with Software pooled in from the existent units on resource assessment, Wind turbine design & load calculation, spatial mapping and coding. It is open to all, both for NIWE and Non-NIWE personnel, for learning new skill sets. This is an outreach program of NIWE to uplift the capabilities of the NIWE staff as well as renewable energy stakeholders. This facility is open during the working hours at KS&M's Work group facility. Facility will provide a platform for spurring the imagination through tools of simulation in interdisciplinary engineering & physics domains.
- **Technology Think Tank (TTT).** This a programme organised every week on the afternoons of Thursdays

where resource personnel from NIWE's different units take turns to bounce ideas, share information and knowledge known to them which would be beneficial to others. This is an open meeting and entry is free. All interested stakeholders both internal as well external participate. Public notifications are made available in advance at NIWE website to plan the participation. This form provides an avenue for open discussion of concepts and for furthering research. Engineering and professionals from otherwise domains participate enthusiastically to share the discussion arena after the session is completed and the floor is opened for discussion.

- **Internship Program.** Students on internship and final project are accommodated and provided wholesome view of the technology and its applications both at NIWE's Chennai campus as well as at the Wind Turbine Research Station (WTRS) facility at Kayathar. Knowledge thus shared with the students helps them identify ideas and areas for their future thesis work or career options within and outside NIWE.

Students pursuing their Master's in various allied subjects related to Wind Energy & Engineering are allowed to seek mentorship and complete their work in NIWE. New areas are identified for the students to work and create knowledge. The knowledge thus generated for the Thesis completion is shared by the students with the NIWE fraternity for mutual growth.

- **Research and Development Projects & Facilities.** Projects in nature of research would be undertaken to generate knowledge that would benefit NIWE & other stakeholders. Staff of NIWE and industry can jointly work in such projects for mutual sharing, capacity building and growth. This would help bring traction to NIWE's technical force. Consequently, new R&D facilities can be built based on this knowledge creating new paradigm in business & operation.

INTERNATIONAL TRAINING

16th International Training Course on
"WIND TURBINE TECHNOLOGY AND APPLICATIONS"
 during 12th August - 8th September 2015

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 18 SRRA stations were supplied under SDSAP-2013 policy during 1st April to 15th June 2015.
- Calibration of 12 Pyranometers and 6 Pyrhemiliometers were carried out during 16th March to 15th June 2015.
- Mr. Prasun Kumar Das and Mr.Karthik.R visited IMD, Pune during 20th to 24th April 2015 for training on inter-comparison of primary standards.
- Micrositing carried out at Acharya Nagarjuna University, Guntur for relocation of Guruzala SRRA station.
- Belgaum SRRA station relocated in the campus of Rani Chennamma College of Agriculture, Gokak, Karnataka.
- Micrositing carried out at Gandhi Nagar for relocation of PDPU Gandhi Nagar SRRA & AMS stations.
- Micrositing carried out in Goa during 8th & 9th June 2015 for the relocation of Silvasa SRRA station.
- The Bellary SRRA station was relocated in the campus of the Agriculture Research Station, Haveri, Karnataka on 13th June 2015.
- 2nd meeting of the Technical Committee for project "Study on Grid Integration of Solar PV Power plant with existing 200 kW Wind Electric Generator at NIWE, Chennai held on 11th April 2015.
- Review meeting on making and rolling out Solar Atlas with the officials of GIZ, Suntrace, and Dr. R.D. Vashistha, Former DDGM, IMD on 6th May 2015.

Visitors

- Mr.Achim Fabig, Consul General, Consulate of Germany, Chennai & Dr.Wilfried Damm, Director, IGEN, GIZ, New Delhi visited SRRA facilities, had brief interaction with the Scientists and also visited calibration laboratory of SRRA at PITAM, Chennai on 2nd June 2015.

Launch of first online Indian Solar Radiation Atlas, SolMap by NIWE-GIZ

'Indian Solar Radiation Atlas and Stakeholders Meet' was organized by SRRA in Hotel Hablis, Chennai on 3rd June 2015, where in the Indian Solar Atlas was launched by Mr. Tarun Kapoor, Joint Secretary, MNRE, New Delhi along with the release of the brochure on Indian Solar Atlas in presence of Dr. S. Gomathinayagam, Director General, NIWE, Chennai, Mr. Achim Fabig, Consul General, Consulate of Germany, Chennai & Dr. Wilfried Damm, Director, IGEN, GIZ, New Delhi. The online GIS layer of Indian Solar Atlas provides 3 SolMaps for (DNI) Direct Normal Irradiation, Global Horizontal Irradiation (GHI), Diffuse Horizontal Irradiation (DHI) at 3 km resolution for entire India.



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

Dr. S. Gomathinayagam, Director General

- 35th Governing Council at MNRE, New Delhi on 1st April 2015.
- 3rd Governing Council of NISE at New Delhi on 6th April 2015.
- Parliamentary Committee Meeting at MNRE, New Delhi on 7th April 2015.
- Panel Discussion on Renewable Energy-RSD's -15 at IIT Madras on 11th April 2015.
- Discussion on CERC Draft Regulations for Renewable Energy at MNRE, New Delhi on 17th April 2015.
- Workshop on Enhanced RE Grid integration with emphasis on forecasting REMC & balancing capacity at India Habitat Centre, New Delhi during 22nd to 23rd April 2015.
- Technical Orientation Programme on Wind Resource assessment 8 small wind energy and hybrid systems programmes including review of other renewable energy programmes for North Eastern states Meeting at Shillong during 24th & 25th April 2015.
- RLMM Committee for WT models and manufacturers on working & scope of RLMM Committee at MNRE New Delhi on 29th April 2015.
- Launch of Internationally Accredited Certification Services for Wind Turbines in India at GRT Grand, Chennai on 8th May 2015.
- BIS Meeting at New Delhi on 19th May 2015.
- Meeting on Need for long term RE Policy and Legal Forms at MNRE, New Delhi on 20th May 2015.
- Indian Solar Radiation Atlas launch with web service for Radiation under Indo-German (GIZ) partnership on 3rd June 2015.
- Parliamentary Standing Committee Meeting on Energy at Kolkata on 4th June 2015.
- Ph.D Confirmation Meeting of Mr. Surendra Bogadi at MIT Chrompet on 9th June 2015.
- 2nd Meeting of Technical evaluation committee to review the R&D proposals in thrust areas of small wind energy & hybrid systems on 11th June 2015.
- Signing of MoU with (1) St.Peter's University and (2) FOWIND on 15th June 2015.
- Meeting on Integration of Large scale renewable energy at MNRE, New Delhi on 19th June 2015.
- 4th International Wind Conference & Exhibition-WE 20

by 2020 session on "Forecasting of Wind Energy in India" at CODISSA, Coimbatore on 21st June 2015.

- Operational Review Meeting (ORM) at MNRE, New Delhi on 23rd June 2015
- Small Wind & Hybrid Scheme Committee Meeting at MNRE, New Delhi on 26th June 2015.

Rajesh Katyal, Deputy Director & Head, OSWHS & IB

Attended the Parliamentary Standing Committee meeting on Energy at Kolkata on 4th June 2015.

K. Boopathi, Additional Director & Head, WRA

- Governing Council Meeting at MNRE, New Delhi on 1st April 2015.
- Board of Studies Meeting of Aarupadai Veedu Institute of Technology, Paiyanoor on 11th April 2015.
- Lecture delivered on "Wind Resource Assessment techniques" at Gandhi Gram Rural Institute, Dindigul on 13th April 2015.
- NE region orientation programme on Wind Resource Assessment at Shillong, Meghalaya during 23rd to 28th April 2015.
- 2nd Meeting of Technical Committee to consider various issues relating to large scale integration of renewable generation at Jaipur, Rajasthan on 9th May 2015.
- Technical Committee Meeting for Large Scale Integration of Renewable Energy need for balancing, deviation settlement Mechanism (DSM) and associated issues at Ministry of Power, New Delhi on 27th May 2015.
- Parliamentary Standing Committee meeting on Energy at Kolkata on 4th June 2015.
- Meeting at MNRE, New Delhi on 19th June 2015.
- 4th International Wind Conference and Exhibition (WE20 by 2020) at Coimbatore during 22nd & 23rd June 2015.
- Meeting on Wind & Solar Energy Potential Assessment (Green Energy Corridor) at MNRE, New Delhi on 25th June 2015.

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

Attended Task Force Meeting and presented a PPT on Wind Power Forecasting services – a Pilot project at Tamil Nadu Electricity Board in connection with Wind Power Forecasting Services on 27th May 2015.

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

Indian Solar Radiation Atlas launch with web service for radiation under Indo-German (GIZ) partnership on 3rd June 2015.

S.A. Mathew, M. Saravanan & Bhukya Ramdas

Attended the interaction meet on Solar Atlas with Dr. Winfried Damm, Director, GIZ, New Delhi and Mr. Achim Fabig, Consul General, German Consulate organized by SRRA at NIWE, Chennai on 2nd June 2015.

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

- Meeting on “Bill of Material evaluation committee for issuance of concessional custom duty certificate (CCDC), Special additional duty (SAD) and Excise Exemption duty certificate (EDEC) for manufacturers of WOEG and its components” at MNRE, New Delhi on 17th April 2015.
- Attended a meeting of the committee constituted by MNRE to discuss and recommend a suitable course of action about Working and scope of RLMM committee at MNRE, New Delhi on 29th April 2015.
- Meeting on “Renewable Energy Conformity Assessment Working Group” Organized by BIS on 19th May 2015 at New Delhi.
- Participated in detailed discussions of “Standards Conclave - 2015” on “Role of Standards in International Trade : Challenges, Opportunities and Issues” at Hotel Taj Palace, New Delhi during 21st to 22nd May 2015.

P. Kanagavel, Additional Director & Head, ITCS

- Inaugurated the “Renewable Energy Club” at Arupadai Veedu Institute of Technology, Paiyanoor, Chennai. on 6th April 2015.
- Lecture delivered on Wind Energy: An Comprehensive overview, Wind Power Development in India and Role of NIWE at Gandhigram Rural Institute, Dindigul on 13th April 2015.
- Lecture delivered on “Wind Energy Technology & Applications” at Sri Muthukumaran Institute of Technology, Chennai on 23rd April 2015.
- Lecture delivered on "Wind Energy and Future" on "Global Wind day 2015 Celebrations" at Chennai on 15th June 2015.
- Lecture delivered on “Green Environment and Library” in the National Conference on “Impact of Electronic Resources on Teaching, Learning and Research: Issues

and Opportunities” at Alagappa University, Karaikudi during 24th – 25th April 2015.

- Indian Solar Radiation Atlas launch with web service for radiation under Indo-German (GIZ) partnership on 3rd June 2015.

M. Anvar Ali, Additional Director & Head, ESD

- Lecture delivered on “Wind Turbine Generators” & "Grid Integration of Wind Turbine" in the Gandhigram Rural Institute at Gandhigram on 13th April 2015.
- Indian Solar Radiation Atlas launch with web service for radiation under Indo-German (GIZ) partnership on 3rd June 2015.

Visits Abroad

- **S.A. Mathew** was invited to participate as a Session Chairman in a technical discussion during 2015 AEDCEE conference held on 28th & 29th May, 2015 at Bangkok.
- **Bhukya Ramadas & M. Saravanan** participated in 2015 International Conference on Alternate Energy in Developing Countries and Emerging Countries – 2015 AEDCEE held on 28th & 29th May, 2015 at Bangkok.



FIRST Ph.D WORK AT NIWE

Shri Rajesh Katyal, Deputy Director General and Head, OSWH&IB has been notified eligible for the award of Degree of Doctor of Philosophy (Ph.D.) in Civil Engineering, based on the acceptance of his thesis entitled “Wind Variability Analysis and Shape Optimization of Wind Sensitive Structures for Complex Terrains” from Rajiv Gandhi Proudhyogiki Vishwavidyalaya M.P., University of Technology of Madhya Pradesh.

Publications

- **S.A. Mathew** and **Bhukya Ramadas** presented a paper titled “Aerodynamic Performance to Turbulence and its Impacts on the Power Curve of Wind Turbines” in the International Conference on Alternate Energy in Developing Countries and Emerging Countries – 2015, Elsevier in Energy Procedia.
- **S.A. Mathew** and **M. Saravanan** presented a paper titled “Terrain evaluation for Power Curve Measurements of

wind turbines in variance to the requirements as per IEC 61400-12-1” in the International Conference on Alternate Energy in Developing Countries and Emerging Countries –2015, Elsevier in Energy Procedia.

- **S. Gomathinayagam, R. Karthik** and **G. Giridhar**, Quality Assessment Protocol of Solar Data in SRRA, Akshay Urja: Volume 8, Issue 5, April 2015.

Training / Conferences / Seminars attended by NIWE Scientists

Dr. S. Gomathinayagam, Director General

- Training on Knowledge Management for Organisational Effectiveness at Mussoorie & enroute visit to alternate hydro energy centre at IIT, Roorkee and SRRA stations / UPES Dehradun during 9th to 16th May 2015.

K. Boopathi, Additional Director & Head, WRA

- Workshop on Grid Integration of Renewable and presenting a brief presentation on Wind Power Forecasting Services at NLDC, New Delhi on 9th June 2015.
- Workshop on “Renewable Energy scalability” convened at NIWE, Chennai on 13th May, 2015.

P. Kanagavel, Additional Director & Head, ITCS

- National Conference on “Impact of Electronic Resources on Teaching, Learning and Research : Issues and Opportunities” held at Alagappa University, Karaikudi during 24th-25th April 2015.
- National Conference on Innovative Librarianship in the Knowledge Society: Enhancing Teaching, Learning and Research (NCILKS 2015)” at Coimbatore during 15th - 16th May 2015 and the Pre-Conference Tutorial on 14th May 2015.
- Attended training on the Grid demonstration by iPLON energy study at NIWE, Chennai on 12th June 2015.

M. Anvar Ali, Additional Director & Head, ESD

Attended training on the Grid demonstration by iPLON energy study at NIWE, Chennai on 12th June 2015.

Dr. G. Giridhar, Director & Head, SRRA

- Workshop on “Enhanced RE grid integration with emphasis on forecasting, REMC and balancing capacity” in New Delhi during 22nd to 23rd April 2015.
- One day seminar on “Renewable Energy Production & its challenges” at Prathyusha institute of Technology and Management (PITAM), Thiruvallur on 29th April 2015.

Recent Advances in Structural Engineering – (RASE 2015)

S. Paramasivan, & A.R. Hasan Ali have attended workshop on “Recent Advances in Structural Engineering” – (RASE 2015) organized by CSIR – Structural Engineering Research Centre held on 7th and 8th May, 2015 at CSIR, Chennai.

Arc GIS Training

OSWHS & IS Unit, WRA Unit & SRRA Unit staff have attended the training on Arc GIS training by Shri Maghara Bushanan from M/s. Esri India at NIWE, Chennai during 19th to 23rd May 2015.

ECO Sense – Renewable Energy Lab Equipments Training

P. Kanagavel, Joel Franklin Asaria, G.Arivukkodi, B.Krishnan, T.Sureshkumar, R.Vinodkumar and Bhukya Ramdas have attended the training on “ECO Sense – Renewable Energy Lab Equipments explaining the details about the products and followed by the practical demonstration on the equipments by Mr. Seshnag, R&D Associate from M/s ECO Sense Sustainable Solution Private Limited at NIWE, Chennai during 9th to 11th June 2015.

NATIONAL TRAINING

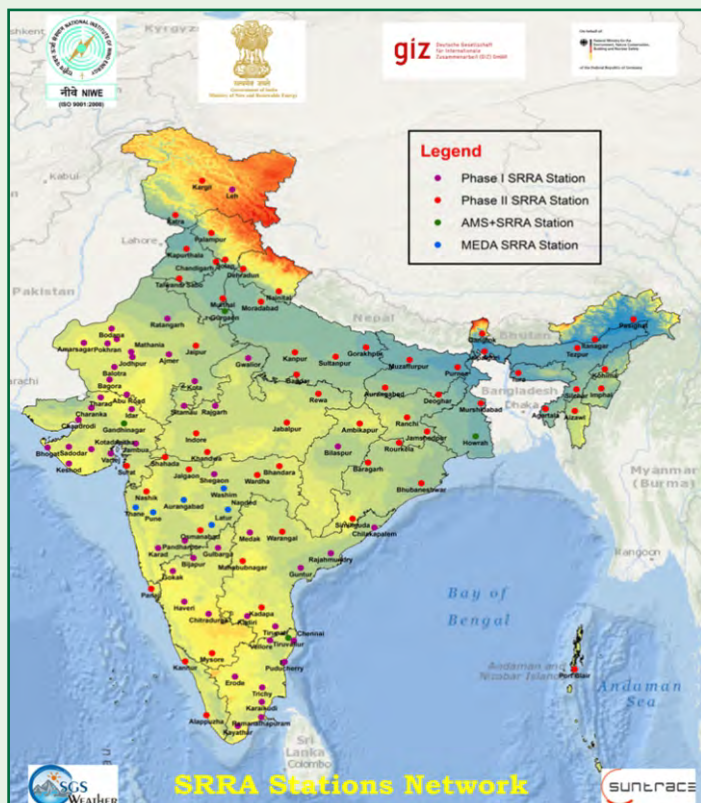
18th National Training Course on “WIND ENERGY TECHNOLOGY”
during 26th - 30th October 2015

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>)

INDIAN SOLAR RADIATION ATLAS

Karthik .R, Assistant Director (Technical) Contract, National Institute of Wind Energy, Chennai E-mail: karthik.niwe@nic.in
Dr. G. Girdhar, Director & Head, National Institute of Wind Energy, Chennai E-mail: girdhar.niwe@gov.in



Prepared Under : Solar Radiation Resource Assessment (SRRA) project & SolMap project of the Indo-German Energy Programme

Solar Radiation Atlas of India

The Ministry of New and Renewable Energy (MNRE), Government of India, through National Institute of Wind Energy (NIWE) and GIZ, India, prepared the “Solar Radiation Atlas”, first atlas of its kind combining satellite-derived data and the world's largest high quality network of simultaneously measured solar ground data. Up to 3 years ground measurements of SRRA network from 115 locations have been used – some for regional adjustment and others for independent validation of the improved satellite maps.

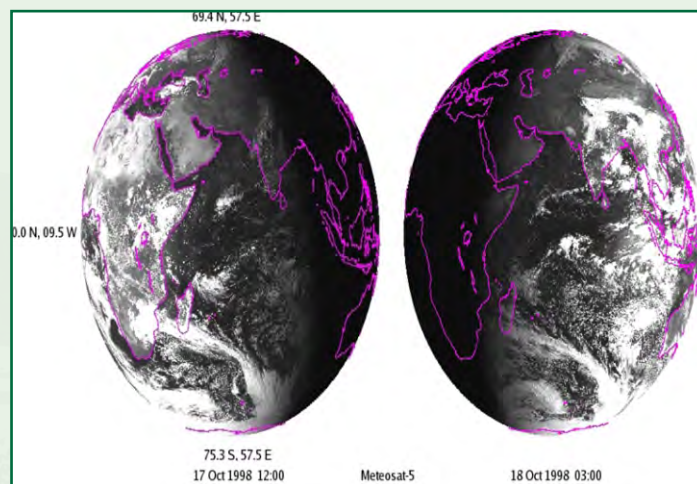
The Solar Radiation Atlas consists of 90 solar radiation maps: 30 maps each for Global Horizontal Irradiance (GHI), Direct Normal Irradiance (DNI) and Diffuse Horizontal Irradiance (DHI) values covering entire India. It covers full 16 years from beginning of 1999 until end of 2014. The maps and GIS-data sets help solar power

developers to find viable sites. The atlas supports policy makers and financial institutions to identify the preferred regions for solar power deployment and support energy estimations.

Satellite Data Sources

Satellite Platform used

1. Meteosat-5 covered India from July 1998 through February 2007. Meteosat-7 covers India from February 2007 through February 2014 and is in continuing service. Both satellites are from the first generation of Meteosat satellite and the visible band (0.45 – 1.0 μm) is used.
2. Geo-location of Meteosat-5 from around 2005 onwards was difficult due to difficulties to stabilize the satellites orbit. Thus, likelihood of erroneous data is higher until Meteosat-7 took over in 2007.



Satellite Position

1. Meteosat-5 from mid 1998 was located at approx. 63°E, while M-7 from late 2006 was at around 57°E.
2. See below graphic.

Temporal coverage of Satellite_ Start date/ End date & Operational duration

1. Meteosat 5 02/05/1991 – 16/04/2007, Indian Ocean position started on 01/07/1998.

2. Meteosat 7 02/09/1997 to 01/31/2014 (ongoing),
Indian Ocean position started on 01/11/2006.

Parameters / Characteristics	Solar Atlas specifications
Spatial coverage	Whole India including islands
Spatial resolution	3 km x 3 km spatial grids
Temporal resolution	Monthly; based on original 30 minutes satellite images
Temporal coverage	1999 to 2014
Solar radiation components	GHI, DNI, DHI
Atlas elements	3 long-term average for GHI, DNI, DHI 3 x 12 long term monthly averages 3 x 16 annual averages 3 inter annual variability over long term Maps of uncertainty

Making of the Atlas

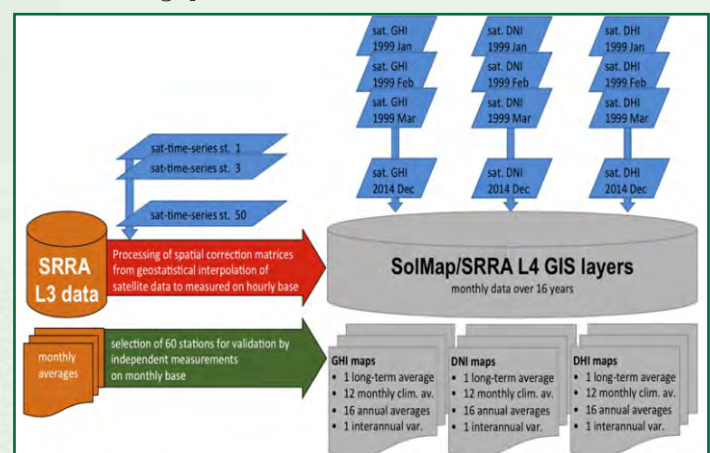
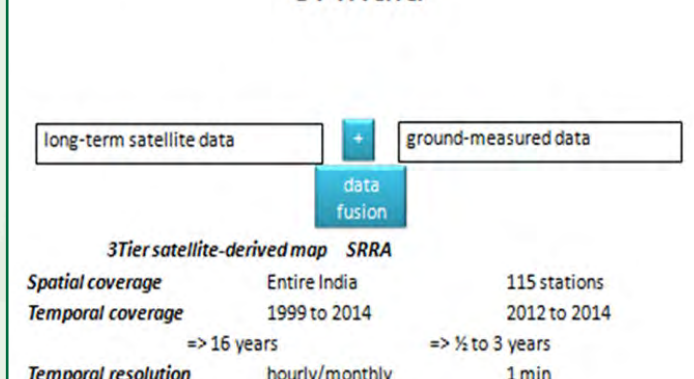
To fill the void in Indian solar energy domain, about availability of a high resolution, high accuracy solar radiation atlas, validated against ground-based measurements, SRRA solar maps was conceptualized. With a view to realizing the immense potential of solar energy in India further, the Ministry of New and Renewable Energy (MNRE) implemented SRRA project with the National Institute of Wind Energy (NIWE) and established the world's largest solar radiation monitoring network, spread in 119 locations across India. Measurements from 54 of these locations spread over

India are used to adjust the satellite-derived estimates on a monthly basis. The final map products are then validated against the remaining independent SRRA stations. The very high number of validation stations spread across the country allows to create uncertainty maps. These display the spatial variability of the map accuracy.

German International Cooperation (GIZ) has provided technical support for solar measurements, data analysis, quality control and the preparation of maps. Suntrace GmbH, Germany, has prepared the maps under GIZ's "SolMap" project with financial support of BMUB (German Federal Ministry for the Environment) under the International Climate Initiative. After completing an international bidding process, monthly satellite derived maps for 16 years (1999 – 2014) were provided by the U.S. company 3TIER.

Data from the Meteosat-5 and Meteosat-7 are applied to derive solar radiation following a modified version of the Perez SUNY algorithm. The satellite-derived radiation data in approximately 3 km spatial resolution then are improved by geostatistical adjustment to SRRA ground measurements. The improvement is done using locations spread over India. With the remaining quality-checked 61 SRRA measurement locations the final solar maps have been validated. To avoid the influence of some data gaps on the results SRRA-Level 3 (L3) data

Input data for the Solar Radiation Atlas of India



have been applied. In this processing level, gaps are filled to minimize the influence of such interruptions on the statistics. For guaranteeing high quality of the ground measurements, the months are excluded from the adjustment and validation process where missing measurements or values not passing the quality check

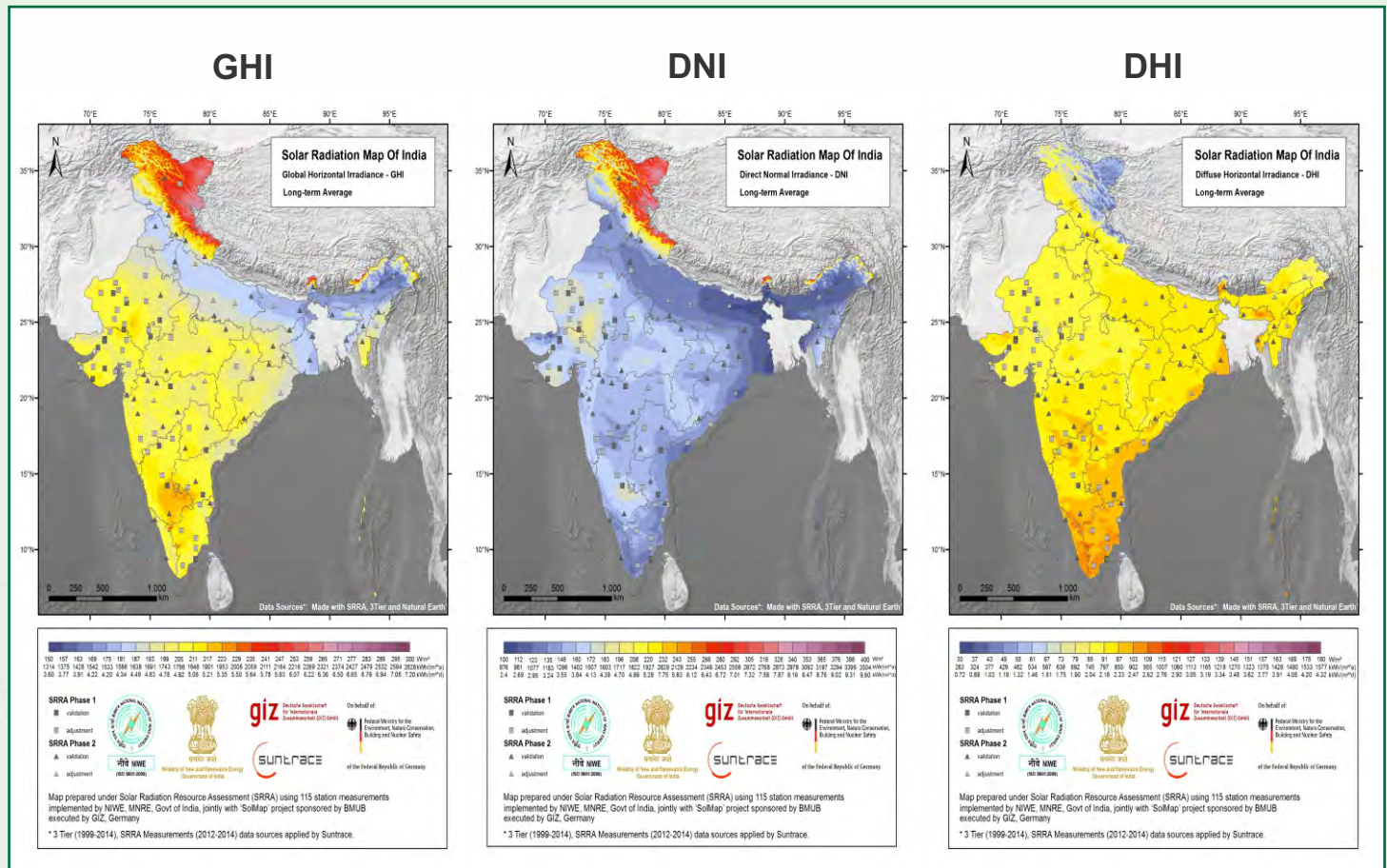
process result in more than 20 % of monthly values. Too short validation sequences are excluded by setting a minimum requirement of at least 6 months of valid measurements. This is first time in India that a solar radiation atlas goes through a rigorous validation process.

Application of Indian Solar Radiation Atlas

The solar radiation atlas is an important tool for solar power project developers, policy makers, and financial institutions. It is useful in identifying the preferred locations for solar power development, supports in energy estimations and also in determining the cost of energy from solar power plants at a certain location.

Knowing the inter-annual variability supports risk assessments. For site-specific engineering of solar plants it helps to know how much radiation comes directly from the sun and how much is expected to come indirectly as diffuse radiation. The typical distribution of the irradiation across the year is expressed by climatological monthly averages. Such maps may be used for planning of grid and capacity extensions.

The online availability of the Solar Radiation Atlas of India is an important for wider use of solar energy in the country. With the release of the Solar Radiation Atlas of India the SolMap-SRRA collaborative project of NIWE/MNRE-GIZ/BMUB reaches a significant milestone in the Indo-German Energy Program collaboration.



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