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EDITORIAL

India's wind energy sector is witnessing rapid expansion, fuelled by advancements in both onshore and offshore wind technologies. As of November 2024, the country has successfully installed 47,959 MW of wind power capacity, making it the fourth-largest producer of wind energy in the world. Boasting a vast coastline, India is primed for substantial offshore wind potential, with estimates suggesting a capacity of over 500 GW. Key states such as Tamil Nadu and Gujarat are at the forefront, spearheading the development of offshore wind farms and positioning India as a leader in renewable energy.

On the Offshore Energy front, the floating buoy was successfully deployed at Sub-zone-1 Gulf of Mannar, Tamil Nadu coast during October 2024 and data is being received at NIWE server. Wind and Oceanographic Measurements are underway.

The Wind Resource Assessment Division carried out data collection and analysis in Leh & Ladakh and Andaman & Nicobar Islands. The division also conducted site identification and surveys at Gujarat, Odisha, Dwaraka and Shivrajpur. During the period, 215 geotagging IDs have been created. Geotagging is capturing GPS coordinates of wind turbine locations and assigning a unique ID to each turbine.

Through our participation in research tasks, NIWE continues to play a significant role in the International Energy Agency's Wind Technology Collaboration Program (IEA Wind TCP). In partnership with the University of Massachusetts, Amherst (UMAAS), and with the support of the Ocean Energy Pathway (OEP) and the Global Wind Energy Council (GWEC), India, NIWE is undertaking a comprehensive desktop study to identify global and local best practices for advancing community engagement in offshore wind development.

The certification division of NIWE has signed an Agreement with M/s. Inox Wind Limited for inclusion of additional Hub Height in the existing Type Certificate issued by NIWE and to take up the first stage of certification process. An Agreement has been signed between NIWE and M/s. Siva Wind turbine India Private Limited for the second stage of Type Certification Process.

The Standards & Regulation division of NIWE has completed the Review of documentation for 10 numbers of RLMM applications of various wind turbine models submitted by wind turbine manufacturers for RLMM.

The Skill Development and Training Division had conducted its 27th National Training Course with 48 participants and two Customised training courses for the 15 officials of Envision Wind Power Technologies India Pvt. Ltd. and for the 25 officials of ReNew Private Limited. The division has also coordinated the student visit of 257 students to gain insights into Wind Energy. 4 students had completed internship at NIWE and twelve students are presently undergoing internship. Under VSDP, 6 batches of ToP training batches have commenced with 180 participants totally to train 2040 participants and 3 nos. of ToT programme totally 281 trainers were completed successfully.

As we close out this quarter, it's truly inspiring to witness the swift progress in wind energy. These advancements are closely aligned with India's ambitious target of reaching net-zero emissions by 2070. We are making meaningful strides toward a cleaner, more sustainable future. Let's continue building on this momentum! Stay with us for more inspiring updates in our next edition!

Dr. Rajesh Katyal, Director General

Contents

Editorial Board

Research and Development

A) IEA Wind TCP

NIWE continues to play a significant role in the International Energy Agency's Wind Technology Collaboration Program (IEA Wind TCP). Shri J.C. David Solomon, representing India, recently delivered a country presentation at the 95th Executive Committee meeting held online from November 12-14, 2024. This global gathering brought together over 70 R&D lab heads and country representatives to discuss cutting-edge research and development in the wind energy sector. Key topics of discussion included the proposed Task 25, Task 11, and the extension of Task 47.

Dr. K. Boopathi DH from NIWE's WRA Division has taken the lead in Task 52 - Large-Scale Deployment of Wind Lidar, in collaboration with the Fraunhofer Institute Germany, under the guidance of Dr. Julia.

B) Global Partnerships

In partnership with the University of Massachusetts, Amherst (UMAAS), and with the support of the Ocean Energy Pathway (OEP) and the Global Wind Energy Council (GWEC), India, NIWE is undertaking a comprehensive desktop study to identify global and local best practices for advancing community engagement in offshore wind development. This study will focus on the Gulf of Mannar region in Tamil Nadu, aiming to:

- **Prioritize Community Needs:** Address the concerns, opportunities, and priorities of the fishing community throughout the entire offshore wind development lifecycle, from site selection to decommissioning.
- **Foster Trust and Engagement:** Develop specific strategies for effective engagement, public participation, and trust-building between offshore wind developers and fishing communities.
- **Assess Environmental Impacts:** Characterize the potential benefits of offshore wind development on fisheries and fishing communities in the Gulf of Mannar region.

By leveraging international collaborations and innovative research, NIWE is committed to driving the growth of sustainable and responsible wind energy development in India and globally.

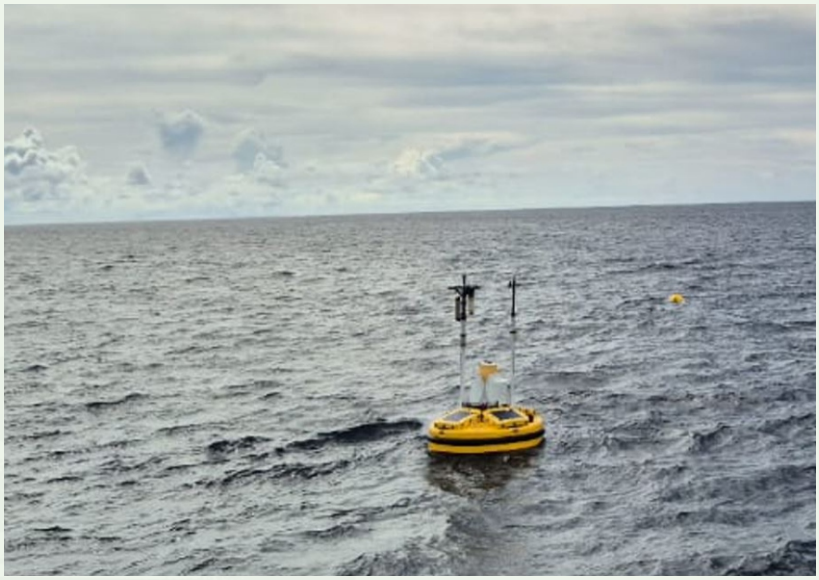
Offshore Wind Development

NIWE has initiated the offshore wind resource assessment and geophysical & geotechnical investigation for development of offshore wind farm of 500 MW at sub zone 1 Gulf of Mannar off Tamil Nadu coast under Model A.

Offshore Wind Resource Assessment using Floating Buoy LiDAR system:

NIWE invited tender for Supply of meteorological and oceanographic data for a continuous period of minimum one year by deploying Integrated Floating Buoy with offshore LiDAR, Meteorological and Oceanographic Sensors (Wave, Current etc.,) on LEASE BASIS at Sub Zone-1 in Gulf of Mannar off, Tamil Nadu Coast in India including Comprehensive Operation and Maintenance for a period of 12 months.

The floating buoy was successfully deployed at Sub-zone-1 Gulf of Mannar, Tamil Nadu coast during October 2024 and data is being received at NIWE server. Wind and Oceanographic Measurements are underway.



Floating Buoy deployed at Gulf of Mannar

Publications

Smt. M.C.Lavanya, Deputy Director (Technical) :

- Presented a paper titled "Optimal sizing for Energy Storage Systems in Hybrid Models Using a Novel Algorithmic Approach" in 11th Power India International Conference PIICON-2024) at the Malaviya National Institute of Technology in Jaipur on 11.12.2024.
- Presented a paper titled "A Novel Hybrid Virtual Synchronous Control Strategy for Enhanced Grid Resilience in Renewable Energy Integration" in Power Electronics, Drives and Energy systems (PEDES 2024) at the National Institute of Technology, Karnataka in Surathkal on 19.12.2024.

Wind Resource Assessment

Wind Resource Assessment

Data Collection and Analysis

Leh and Ladakh Region

- Comprehensive data collection and analysis conducted for multiple sites in the high-altitude regions
- Focus on understanding wind patterns in challenging terrain conditions
- Special consideration given to extreme weather impacts on wind resource potential

Andaman & Nicobar Islands

- Successfully completed data collection and analysis for three key sites:
  - Manglutan
  - Bharatpur
  - Sigmundera
- Prepared detailed summary report incorporating regional weather patterns and seasonal variations

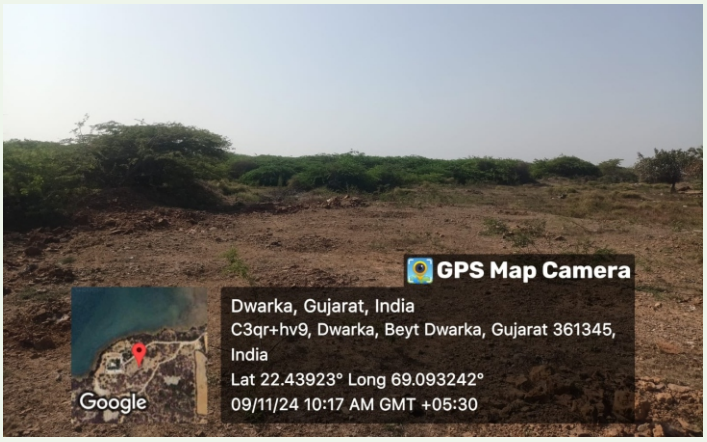
Site Identification and Surveys

Gujarat and Odisha Initiatives

- Conducted extensive site surveys for establishing new Wind Monitoring Stations
- Key specifications:
  - Target height: 150 meters
  - Focus on optimal locations for accurate wind measurement
  - Special attention to terrain and environmental factors

Notable Survey Locations

- Dwaraka Region
  - Evaluated multiple potential sites
  - Considered coastal wind patterns
  - Assessed infrastructure accessibility
- Shivrajpur Area
  - Conducted comprehensive site assessment
  - Analyzed geographical features
  - Evaluated local wind patterns



Dwaraka


Shivrajpur

WRA Infrastructure Management

Forecasting Sites

- Systematic dismantling of data loggers completed in:
  - Multiple locations across Gujarat
  - Key sites in Maharashtra
- Data backup and preservation protocols followed

Telecom Tower Sites

- Successfully completed dismantling operations in Arunachal Pradesh
- Equipment retrieval from telecom towers
- Proper documentation and inventory management of retrieved instruments.

Research Activities

The wind farm SCADA control system

- Performed maintenance activities through NIWE/Contractor
- Successfully installed and configured a SCADA controller system for all 13 PSS and IAF Bhuj station to control the PSS WTGs from IAF Bhuj.
- Successfully demonstrated operation of switching off the turbines at Bhuj Air Force Station on 17.12.2024.

DST – TARE Research Project

- To enhance NIWE's capabilities in hybrid renewable energy systems, establishing a small wind turbine with a capacity of 1kW at NIWE's premises is in process.
- Began the process of establishing a hybrid project within NIWE's premises to enhance NIWE's organizational profile, demonstrate operational efficiency in renewable energy systems, serve basic electrical needs, provide a real-world example of wind turbine technology for student industrial tour at NIWE.

Data Analytics

Consultancy projects

The Wind Resource Assessment (WRA) Division has made significant strides in its consultancy services, demonstrating its commitment to support various stakeholders within the wind industry. The division has successfully completed four Energy Yield Assessment projects and four Verification Procedure project, showcasing its expertise in critical areas of wind energy analysis. Through these efforts, the WRA Division continues to play a crucial role in advancing the understanding and development of wind energy resources.

Geotagging

Geotagging is a process that involves capturing GPS coordinates of wind turbine locations and assigning a unique ID to each turbine. In the case of a wind farm site with multiple turbines, this process was implemented to accurately map the precise location of each turbine. During the period, 215 geotagging IDs have been created.

Issuance of Elevation Certificate for MoD NoC Applications for Wind Power Projects

The purpose of the project is to validate the elevation certificate and the inputs given by the surveyor and client. To do this, DGPS will be used to conduct joint site visits. High-resolution terrain modeling and desktop GIS tools will be used to validate the coordinates of all proposed wind turbine locations, and a report and certificate will be provided.

We have visited 12 WTGs in Gadag District, Karnataka and 3 WTGs in Morbi District, Gujarat for Issuance of Elevation Certificate.

RE Projects

2 MWp Ground Mounted Grid Connected Solar Power Plant at Indian Institute of Management (IIM)-Trichy and 1 MW (AC) Ground Mounted Grid Connected Solar Power Plant at Madurai Kamaraj University (MKU), Madurai

- The division is actively managing two significant solar power projects at prominent educational institutions. These include a 2 MWp ground-mounted, grid-connected solar PV power plant at the Indian Institute of Management (IIM) Trichy campus and a 1 MW (AC) ground-mounted, grid-connected solar power plant at Madurai Kamaraj University (MKU), Madurai.
- The management process involves daily reviews of solar power generation data, complemented by periodic site visits to inspect critical components such as solar arrays, inverters, and transformers. Additionally, there is close oversight of Operation and Maintenance (O&M) activities, including

module cleaning, string checks, and equipment testing.

- These activities are meticulously conducted in accordance with established operational and maintenance agreements. The primary objectives of this proactive approach are to ensure proper maintenance of the solar assets, optimize their performance, and maximize clean power generation from these grid-connected plants. This rigorous management strategy underscores the organization's commitment to maintaining the efficiency and sustainability of these renewable energy installations, contributing significantly to the green energy initiatives of these educational institutions.

Other Works

- The Engineers of NIWE travelled to Odisha during the period from 04.11.2024 to 13.11.2024, along with representatives from GRIDCO & HPCL. The objective was to identify suitable locations for installing 150m & 120m wind monitoring stations that would collect wind data to assess the viability of potential wind power projects in the region. The team surveyed several sites in and around Odisha based on factors like wind flow patterns, access roads, proximity to grid infrastructure, land availability etc.
- The Division Head participated in the Symposium on investment opportunities in Wind Energy and delivered a presentation on Wind power project development in Kerala organized by KSEBL at RECCAA club, Kochi, on 18.10.2024.
- The Division Head participated in the demonstration/operation of switching off the turbines at Bhuj Air Force Station on 17.12.2024.

Publications

Dr. K. Boopathi, Director & Division Head

- "Low capacitor stress reconfigurable quadratic boost converter with fault tolerant capability for rooftop solar PV application". Published in Scientific Report - https://www.nature.com/articles/s41598-024-79891-1 - 16.11.2024- Authors: J.Divya Navamani, K.Boopathi, A.Lavanya, Pradeep Vishnuram, Mohit Bajaj and Levgen Zaitsev. (Impact factor 4.3)

- "Two Decades of statistical approach in reliability prediction of power converters" published in e-prime – Advance in Electrical Engineering, Electronics and Energy – Authors: Divya Navamani J, Boopathi K – https://doi.org/10.1016/j.prime.2024.100851 dated 19.11.2024
- "Comparative analysis of various restructured quadratic boost DC-DC converter" published in MDPI energies – December 2024 – Authors: Divya Navamani Jayachandran, Boopathi Kathirvel and Lavanya Anbazhagan - https://doi.org/10.1051/e3sconf/202454701009

Dr. G. Arivukkodi, Assistant Executive Engineer (AEE)

"Experimental Investigation and Validation of measured Wind Turbine Noise Characteristics using Standardized Technology" published in International Journal for Research in Applied Science & Engineering Technology – Authors: Dr.G.Arivukkodi, J.C.David Solomon, Dr.Rajesh Katyal – https://doi.org/10.22214/ijraset.2024.64651 dated 17.10.2024 (Impact factor 7.894)

Certification & Information Technology

CERTIFICATION

- The Final RFP Document (Stage-I- Pre-bid) has been prepared and submitted to INKEL in connection with Technical Advisory Consultancy Services (TACS) for "Development of minimum 14 MW Wind Power Project" at Palakkad. All three milestones have been completed successfully as per the Agreement signed between NIWE and INKEL Limited for Stage-I Pre-bid.
- An Agreement has been signed between NIWE and M/s. Inox Wind Limited for the third & final stage of Certification process viz., Type Certification of "INOX DF/3000/145 3.0MW Power Booster Mode 3.3 MW Rotor Blade Type SR71 V2 (T-Bolt) Hub Height 100m IEC WT Class IIIB wind turbine model". The final stage of Type Certificate process has been completed successfully and the Type Certificate has been issued.
- Inking of Agreement between NIWE and M/s. Pioneer Wincon Energy Systems Private Limited for the first stage of Certification process viz., Pre – Evaluation of documentation in connection with Type certification for the wind turbine model "Pioneer Wincon 750/57, 750 kW, PW28.0, HH 78.0m & HH 90.0m, IEC III A" is under process.
- An Agreement has been signed between NIWE and M/s. Inox Wind Limited for inclusion of additional Hub Height in the existing Type Certificate issued by NIWE for wind turbine model viz., "INOX DF/3000/145 3.0 MW Power Booster Mode 3.3 MW Rotor Blade Type SR71 V2 (T-Bolt) Hub Height 100m IEC WT Class IIIB" and to take up the first stage of certification process. The Pre-Evaluation process has been completed.
- An Agreement has been signed between NIWE and M/s. Inox wind Limited to take up the second stage of Type Certification process viz., "Evaluation of documentation in connection with the inclusion of additional Hub Height in the existing Type Certificate issued by NIWE for the wind turbine model of "INOX DF/3000/145 3.0 MW, Power Booster Mode 3.3 MW Rotor Blade Type SR71 V2 (T-Bolt) Hub Height 100m/122.5 IEC WT Class IIIB". The Evaluation process is ongoing.
- An Agreement has been signed between NIWE and M/s. Inox wind Limited to take up the third & final stage of Type Certification process viz., "Certification of the wind turbine model of "INOX

DF/3000/145 3.0 MW, Power Booster Mode 3.3 MW Rotor Blade Type SR71 V2 (T-Bolt) Hub Height 100m/122.5 IEC WT Class IIIB". The Type Certificate has been issued.

- An Agreement has been signed between NIWE and M/s. Inox Wind Limited for inclusion of additional Hub height and Blade type in the existing Type Certificate issued by NIWE for wind turbine model viz., "INOX DF/3000/145 3.0 MW Power Booster Mode 3.3 MW Rotor Blade Type SR71 V2 (T-Bolt) Hub Height 100m/122.5m/140m IEC WT Class IIIB". The Pre-evaluation process is ongoing.
- An Agreement has been signed between NIWE and M/s. Siva Windturbine India Private Limited for the second stage of Type Certification Process Viz., "Evaluation of Siva U57 WT model in connection with Type Certification". The Evaluation process is ongoing.

Visit

Shri S.A. Mathew and Shri S. Paramasivan visited Inox's manufacturing facility located at Barwani, Madhya Pradesh for manufacturing evaluation of Tower in connection with the inclusion of additional Hub Height in the existing Type Certificate issued by NIWE for the wind turbine model of "INOX DF/3000/145 3.0 MW, Power Booster Mode 3.3 MW Rotor Blade Type SR71 V2 (T-Bolt) Hub Height 100m/122.5m IEC WT Class IIIB"

INFORMATION TECHNOLOGY

- Continued to maintain the IT infrastructure to keep servers, storage, systems, and software up and running.
- Continued to provide IT support for users at NIWE and its stakeholders.
- Carried out procurement of new hardware, software, and AMC services.
- POC of Web Application Firewall (WAF) has been completed.
- Created Automatic backup of Operational Data in Data Center and Disaster Recovery.

Web Portals

Version 1.0 Design and development of the NIWE website in line with GIGW guidelines is Completed.

Testing, Standards and Regulation

TESTING

- Power Performance Measurements as per IEC Standard (IEC 61400-12-1:2017) for "INOX DF/3000/145 3.0 MW Power Booster Mode 3.3 MW Rotor Blade Type SR71 (T-Bolt), Hub Height 100 m IEC WT Class IIIB" wind turbine with 3.3 MW Power Booster mode operation at Rajkot, Gujarat for M/s. Inox Wind Limited have been completed. Test report on Power Performance measurements has been issued.
- Load Measurements, Safety & Function testing for "INOX DF/3000/145 3.0 MW Power Booster Mode 3.3 MW Rotor Blade Type SR71 (T-Bolt), Hub Height 100 m IEC WT Class IIIB" wind turbine with 3.3 MW Power Booster mode operation at Rajkot, Gujarat for M/s. Inox Wind Limited. have been completed. Test reports on Load Measurements, Safety & Function testing have been issued.
- Ministry of New and Renewable Energy (MNRE) has constituted a committee to examine various aspects of ramping up domestic wind turbine manufacturing capacity vide OM dated 09-07-2024. In this regard, information / data has been obtained from various wind turbine manufacturers for their wind turbine models included in Revised List of Models and Manufacturers (RLMM) based on a structured format finalized by the Committee. Preparation of a report based on the information obtained is in progress.

STANDARDS AND REGULATION

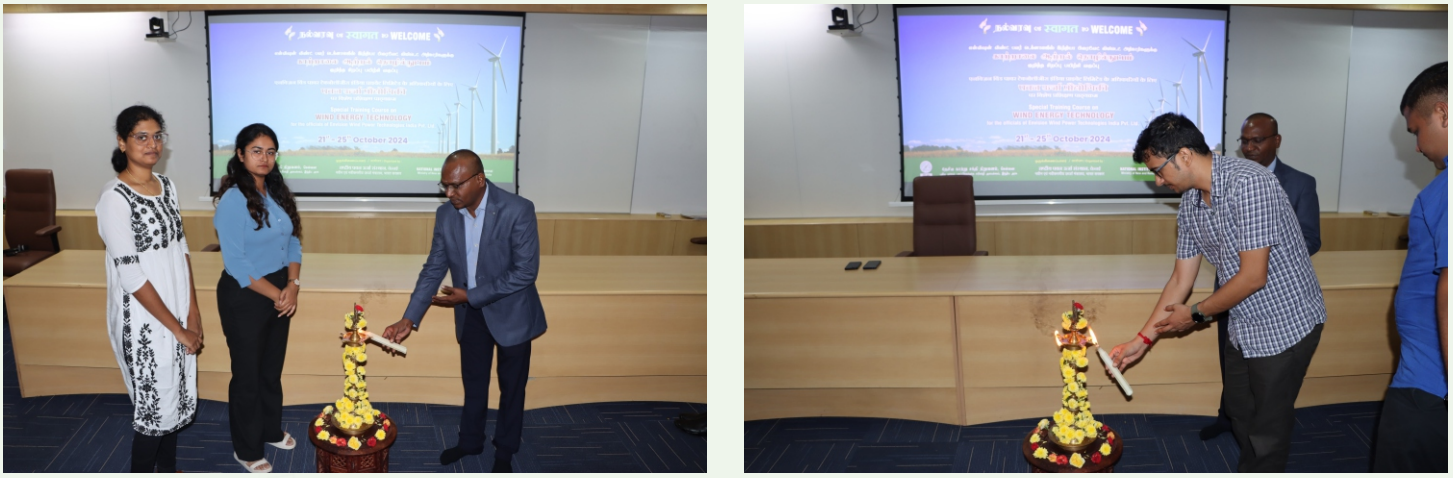
- Review of documentation has been completed for 10 numbers of RLMM applications of various wind turbine models submitted by wind turbine manufacturers for RLMM. Further, technical support has been provided to MNRE for implementation of Revised Lists of Models and Manufacturers of wind turbines (RLMM) process. Provided support for RLMM committee in 3 RLMM committee meetings held during the period.
- Provided technical support to Bureau of Indian Standards (BIS) in connection with the works related to standards. Further, the works related to preparation of draft Indian standards / IEC standards & IECRE documents are under progress.
- The continual improvement and maintaining the quality management system are ongoing.

Skill Development and Training

TRAINING PROGRAMMES

Special Training Course for the officials of Envision Wind Power Technologies India Pvt. Ltd.

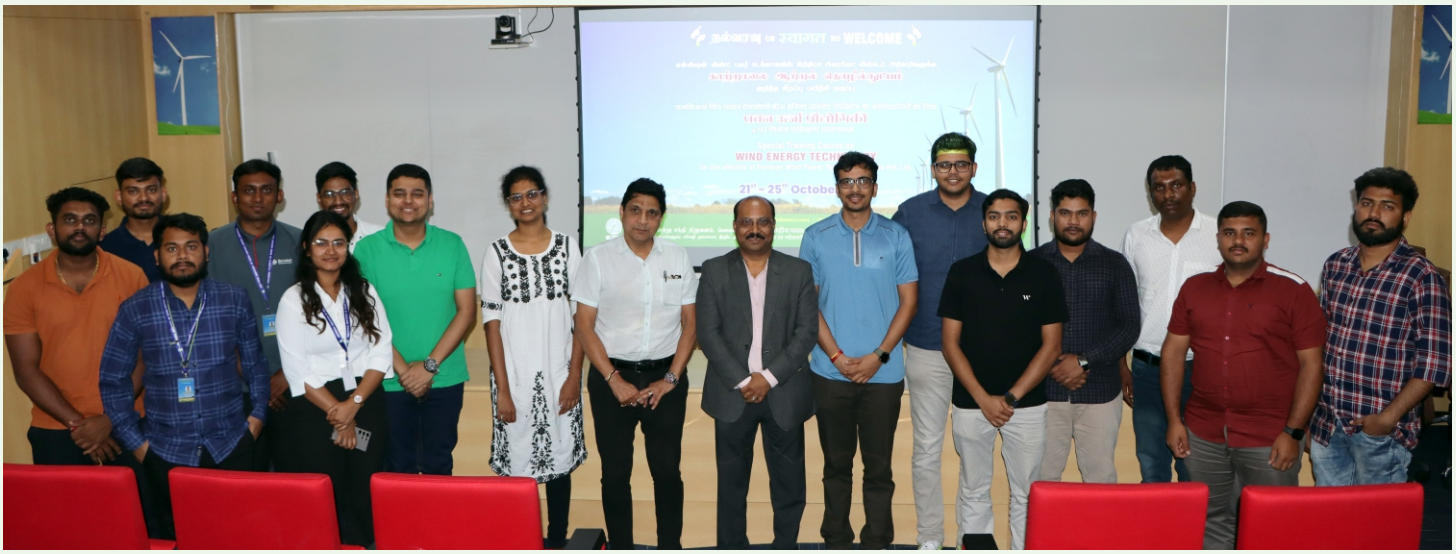
The Skill Development and Training Division had successfully conducted the special training course on "WIND ENERGY TECHNOLOGY" for the officials of Envision Wind Power Technologies India Pvt. Ltd. held during 21.10.2024 to 25.10.2024. The course addressed all the aspects of Wind Power starting from what is wind to wind resources assessment, project implementation and operations & maintenance aspects in a focused manner along with offshore wind towards going for economically viable wind farm projects. A total of 15 numbers of Envision officials working in different facets of wind projects have participated in the course. Dr. P. Kanagavel, Director & Head, SDT Division, NIWE inaugurated the Course along with the participants.



Dr. P. Kanagavel inaugurating the course along with the participants

There were 20 presentations scheduled during the course, which was handled by 12 NIWE Engineers & Scientists.

Glimpse of Technical sessions



Group photo of the participants

Mr. R.V Prasad, Managing Director-India, Envision Energy visited on the last day of the course. He discussed with the trainees about the training and collected their feedback and shared his view.

The participants were asked to share their views about the training and some of them shared their feedbacks by appreciating NIWE and the skills of organizing and conducting the course in the best possible way.

Special Training Course for the officials of ReNew Private Limited

The Skill Development and Training Division had successfully conducted the special training course on "Wind Energy Technology" for the officials of M/s. ReNew Private Limited held during 11.11.2024 to 16.11.2024. The course addressed all aspects of Wind Power starting from what is wind to wind resources assessment, project implementation and operations & maintenance aspects in a focused manner along with financial and policy aspects towards going for economically viable wind farm projects. A total of 25 numbers of ReNew officials working in different facets of wind projects had participated enthusiastically in the course.

Before technical sessions started, Dr. P. Kanagavel, Director & Head, SDT Division, NIWE had welcomed the participants and asked to introduce themselves. Shri Rahul Sri Srimal, Deputy Manager, HR has also addressed the participants and hoped the participants would gain practical knowledge through this training course.

During the course, 11 classroom sessions were scheduled, which was handled by 10 NIWE Engineers / Scientists.

Visit to NIWE RE facilities: The participants visited the Renewable Energy facilities available in NIWE campus, such as, Water Pumping Windmill, Vertical & Horizontal Axis Small Wind Turbines, Wind-Solar Hybrid System, Wind Turbine Nacelle Assembly facility, Metrological Mast, Biogas Plant and SRRA Station.

Study Visit : The participants were taken to the southern part of Tamil Nadu, to visit Wind Turbine Test Station at Kayathar, where they got an exposure on small and large wind turbine testing process. Also, visited Operation and Maintenance facilities of Wind Turbines at RS Windtech Engineering Pvt. Ltd., Aralvaimozhi, Centralized Monitoring Station - SCADA facilities at Suzlon Global Services Limited, Radhapuram and at Wind World (India) Limited, Manur.


Participants visiting the renewable facility at NIWE Campus, Chennai

Participant's Appreciation : The participants appreciated NIWE for having organized a course to gain knowledge on Wind Energy. They enjoyed and appreciated the classroom lectures, visit of renewable facility, and study visit that provided a positive learning environment and very effective.

Participants at WTTS, Kayathar

Participants at RS Windtech Engineering Pvt. Ltd.

Participants at Suzlon Global Services Limited, Radhapuram

Participants at Wind World (India) Limited, Manur

27th National Training Course

The Skill Development and Training Division organized the 27th National Training Course on "Wind Energy Technology" from 18.12.2024 to 20.12.2024 to address all aspects of Wind Power starting from introduction to wind and its technology, wind resource assessment, installation and commissioning, operation and maintenance aspects of wind farms in a focused manner along with financial and policy aspects. The course was attended by 48 participants from 8 States viz. Andhra Pradesh, Gujarat, Haryana, Karnataka, Maharashtra, Rajasthan, Tamil Nadu and Telangana and 1 Union Territory viz. New Delhi. There were 39 male and 9 female participants with diverse background attended the training course.

The training course was inaugurated by Dr. P. Kanagavel, Director & Head, SDT Division, NIWE with the training participants. The 11 presentations made during the training course were handled by nine Scientists / Engineers of NIWE.

Inauguration of the Course

The participants visited the Renewable Energy facilities available in NIWE campus for practical exposure, and had an opportunity to understand the Water Pumping Wind Mill, Vertical and Horizontal Axis Small Wind Turbines, Wind-Solar Hybrid System, Wind Turbine Nacelle, Wind Monitoring Station - Meteorological Mast, LiDAR, Solar Calibration Laboratory and Solar Radiation Resource Assessment (SRRA) Station.

During the Certificate distribution, some of the participants shared their feedback and stated that the training had encouraged a positive learning environment and found it very beneficial. They also expressed their appreciation

Distribution of the Certificate

to NIWE for organizing the training course. Thereafter, Dr. Rajesh Katyal, Director General, NIWE and Dr. P. Kanagavel, Director & Head, SDT Division, NIWE distributed the Course Certificates to all the participants. Dr. P. Kanagavel, Director & Head, SDT Division, NIWE thanked the participants for their appreciation.

Group photo of the Participants

Vayumitra Skill Development Programme (VSDP)

Ministry of New & Renewable Energy (MNRE), Government of India has sanctioned, "Vayumitra Skill Development Program (VSDP)" to create skilled workforce for the Indian wind energy sector especially the trained manpower for the operation & maintenance of wind farms in the country as per the industry demand/needs so as to achieve the Government of India targets and other future targets.

Activities completed and in progress:

- 15 Training Centers (7 Training Partners) have been selected through 2nd Expression of Interest (EoI) for conducting Training of Participants (ToP) programme and allotted the batches.
- Already, 2040 Participants have been trained through 68 batches of ToP so far and another 4 batches have commenced with 120 participants.
- Ten batches of Training of Trainers (ToT) programme has been successfully completed and trained 281 trainers.

Internship Programme

The "NIWE-Academic Associate Programme" (NIWE-AAP) aims to encourage students and provide an opportunity to choose renewable energy as their career option. To create awareness and interest in the field of renewable energy research among the young talented Science, Management and Engineering students NIWE invites applications from the eligible candidates for the "NIWE-Academic Associate Programme" (NIWE-AAP).

The duration of the Internship is two weeks to six months. NIWE-AAP will provide opportunities for the graduate students/post graduate students/ Lecturers/Professors to work with scientists/engineers on NIWE's projects.

During the period from October to December 2024, 37 applications were received out of which 9 students got enrolled. 4 students were issued Internship Certificates and 12 are undergoing Internship.

From the commencement of the NIWE-Academic Associate Programme (NIWE-AAP), One hundred sixty three (167) Internship Certificates were issued to the successfully completed Interns.

Students & Training Participants Visit

To create awareness and to motivate towards research on wind energy, achieving the indigenization and also to create awareness about the activities and services of NIWE, schools and college students are encouraged to visit the campus.

During the period from October to December 2024, the following visits were coordinated and 257 students had attended the same.

S.No.	Name of Institution	No. of Students	No. of Staff	Visited on
1	Kingston Engineering College vellore	46	1	29.10.2024
2	Aadhiprasakthi College of Engg., Kalavai	60	1	21.11.2024
3	SRM Valliammai Engg. College, Kattankulathur	45	1	22.11.2024
4	NITTTR, Chennai	20	1	28.11.2024
5	The Pupil International School, Chennai	36	1	10.12.2024
6	Md. Sathak College of Engg. OMR, Chennai	50	1	13.12.2024

Small Wind Turbines: A Breath of Fresh Air for Urban India

Author : J.C. David Solomon, Director & Head, R&D Division, WTRS (Incharge) - Email : david@niwe.res.in

India, with its diverse topography and vast wind resources, has emerged as a global leader in renewable energy. While large-scale wind farms have been instrumental in meeting the country's energy demands, a significant untapped potential lies in urban areas. Small wind turbines (SWTs), with their ability to harness wind energy at the local level, offer a promising solution to power urban infrastructure and reduce carbon emissions.

Harnessing Urban Winds: A Viable Solution

Urban areas, often characterized by high-rise buildings and complex wind patterns, present unique challenges for wind energy harvesting. However, advancements in SWT technology have made it possible to efficiently capture wind energy in urban environments.

Key Innovations Driving Urban Wind Potential are 1. Vertical Axis Wind Turbines (VAWTs). Compact Design: VAWTs are more compact and can operate in various wind directions, making them suitable for urban settings. 2. Lower Noise Levels: Their design minimizes noise pollution, making them ideal for residential and commercial areas. 3. Advanced Blade Designs. High-Efficiency Blades: Innovative blade designs, such as airfoil profiles and variable pitch systems, maximize energy capture. 4. Durable Materials: Robust materials and corrosion-resistant coatings ensure long-term performance in harsh urban environments. 5. Smart Grid Integration. Real-time Monitoring: Advanced sensors and IoT technologies enable real-time monitoring and control of SWT performance. 6. Grid Synchronization: SWTs can be seamlessly integrated into the grid, contributing to energy supply and demand balancing.

A New Era of Urban Architecture

The integration of SWTs into urban architecture can revolutionize the way we design and construct buildings. By incorporating SWTs into building facades or rooftops, architects can create aesthetically pleasing and energy-efficient structures. This integration can lead to the development of "energy-positive" buildings that generate more energy than they consume.

Potential Architectural Innovations are, (1) Wind-Harvesting Facades: Building facades can be designed to incorporate SWT arrays, generating clean energy while providing shade and insulation. (2) Rooftop Wind Farms: Rooftop installations of SWTs can harness wind energy

from taller building with unhindered view, where wind speeds are often stronger. (3) Hybrid Systems: Combining SWTs with solar panels can create hybrid energy systems that optimize energy production. (4) Integrated Urban Planning: Municipalities can incorporate SWT-friendly infrastructure into city planning, enabling smarter energy networks across urban hubs.

Accelerating Electric Vehicle Adoption

Small wind turbines can play a significant role in the advancement of electric vehicles (EVs) in India by contributing to the development of decentralized charging infrastructure. The increasing demand for EVs necessitates a sustainable energy supply for charging stations, and SWTs can address this need by harnessing wind energy locally.

How SWTs Support EV Growth. (1) Off-Grid EV Charging Stations: SWTs can power standalone EV charging stations in urban and semi-urban areas, reducing dependency on grid electricity and ensuring uninterrupted charging even during power outages. (2) Reduced Carbon Footprint: By generating renewable energy locally, SWTs help reduce the environmental impact of EVs, making the entire value chain more sustainable. (3) Hybrid Charging Solutions: SWTs, when combined with solar panels, can create hybrid energy systems for EV charging, optimizing energy availability and reliability. (4) Integration with Smart Micro Grids: SWTs connected to smart micro grids can dynamically allocate energy to EV charging stations based on demand, ensuring efficient energy utilization.

The integration of SWTs into EV infrastructure can also benefit rural areas, where grid connectivity may be limited. Locally generated wind energy can support the adoption of EVs in these regions, fostering a more inclusive transition to electric mobility.

A Circular Approach to Lower Costs

To accelerate the adoption of SWTs in India, a circular economy approach can be implemented to reduce costs and environmental impact. By focusing on the lifecycle of SWTs, from manufacturing to end-of-life disposal, we can identify opportunities for resource efficiency and waste reduction.

Key Strategies for Circularity are (1) Modular Design: Modular design can facilitate easier maintenance, repair, and component replacement, extending the lifespan of SWTs. (2) Recyclable Materials: Using recyclable materials in the construction of SWTs can minimize waste and reduce environmental impact. (3) End-of-Life Recycling: Developing efficient recycling processes for SWT components can recover valuable materials and reduce landfill waste. (4) Local Manufacturing: Promoting local manufacturing can reduce transportation costs and support domestic industries.

Bird-Friendly Design

To ensure the safety of birds, it is crucial to implement bird-friendly design principles for SWTs like (1) Optimal Siting: Careful site selection can minimize the impact on bird routes and foraging areas. (2) Bird Detection Systems: Advanced sensors can detect birds approaching the turbine and temporarily stop or slow down the blades. (3) Camouflaged Designs: Utilizing blade colours and patterns that are visible to birds can help reduce collisions. By incorporating these measures, we can harness the power of wind energy while protecting our avian friends.

Unlocking the Potential of Urban Wind Energy

The adoption of small wind turbines in urban areas can catalyze a broader shift toward decentralized energy systems. They empower individuals, communities, and businesses to take charge of their energy needs while contributing to national energy goals. Additionally, SWTs can play a crucial role in disaster resilience by providing localized energy in times of grid failure or emergencies.

The Road Ahead

India's urban landscapes are poised for a transformation as small wind turbines integrate into city skylines and infrastructure. By embracing this technology in a bigger way urban India can lead the way in sustainable energy innovation, offering a model for the rest of the world to follow.

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