Indian Wind Power

Volume: 3 Issue: 2 June - July 2017 ₹ 10/-
Bimonthly, Chennai

windergy INDIA 2017 WIND POWER FOREVER **Special**

Expertise offered to Wind & Solar Energy Stakeholders

Research & Development

- Supports multi institutional research on wind energy
- Performance testing of Small Wind Turbines / Aerogenerators
- Empanelment of Small Wind Turbine manufacturers
- Acoustic Noise measurement
- Study of wind-solar-diesel hybrid system

Wind Resource Assessment

- Site condition assessments for wind monitoring & wind farm development and field visits
- Procurement, installation and commissioning of met mast of 50m to 120 m height
- Providing measurement campaign management, assisting clients in the Installation and monitoring of meteorological masts, LIDAR and SODAR stations
- Data collection, management, quality control and wind energy resource reporting
- Analysis of Data with sophisticated software tools and techniques
- Long-Term Trend Data Analysis (NCEP/NCAR/MERRA)
- Turbine array layout design, optimization, field Micro siting and Produce bankable P50 P75, and P90 yield predictions.
- Investment Grade wind energy resource assessment reports (gross/net Predictions, uncertainty analyses, etc.)
- Analysis of existing wind farm operations
- Technical due diligence in complying with international standards.
- Power curve demonstration guarantee test
- Preparation of Tender document for development of wind farm
- Helping the evaluation of tender as one of the tender evaluation committee members.
- DPRs (Detailed Project Reports) preparation through State of art software tool for wind farm developers

Testing Services

- As per Internationally accepted procedures and stipulations for
- Power Performance measurements
- Power Quality measurements
- Yaw efficiency test
- Load measurements
- Safety and function tests
- User defined measurements
- The services are not limited by type or size of the Wind Turbines
- The services are certified as per the requirements of ISO 9001: 2008 and accredited as per the requirements of ISO/IEC 17025 : 2005

Certification Services

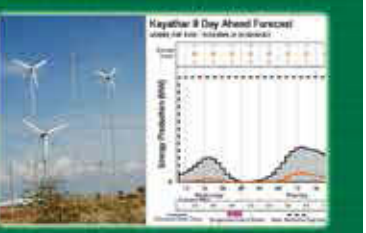
- Accord type approval / type certification to wind turbines in accordance with Indian Type Certification Scheme [TAPS - 2000 (amended)]. Type Certification Services are certified as per ISO 9001 : 2008
- Preparation of Indian standards on wind turbines
- Issue the Revised List of Models and Manufacturers (RLMM) of wind turbines periodically
- Issue the recommendation for grid synchronization to facilitate installation of prototype wind turbines

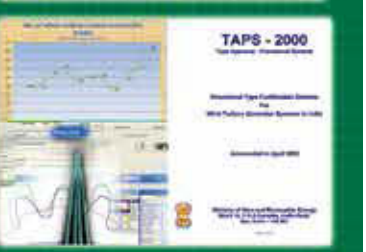
Training

- Capable of providing
- Wind / Solar Resource Measurement & Analysis
- Wind Resource Modelling Techniques
- Wind Speed Statistics / Solar irradiation and Energy Calculations
- Micro-siting and Layout of wind / solar farms
- Design and Safety requirements as per standards
- Wind Turbine / Solar Technology
- O & M practices

Solar Radiation Resource Assessment

- Direct Normal (DNI), Diffused Horizontal (DHI) & Global Horizontal (GHI) irradiation measurements
- Data quality checking
- Calibration Laboratory for solar
- Solar resource data delivery
- Solar Map preparation
- Preparation and vetting of feasibility, DPR of Solar projects





NATIONAL INSTITUTE OF WIND ENERGY

Formerly "Centre for Wind Energy Technology"

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IWTMA
INDIAN WIND TURBINE MANUFACTURERS ASSOCIATION

Indian Wind Power

A Bi-monthly Magazine of Indian Wind Turbine Manufacturers Association

Volume: 3 Issue: 2 June - July 2017

Contents

Indian Wind Turbine Manufacturers Association

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From the Desk of the Chairman - IWTMA

Dear Readers,

Greetings from IWTMA!

IWTMA and Global Wind Energy Council (GWEC) wish to thank the Ministry of New and Renewable Energy (MNRE), allied Government Agencies, Sponsors, Exhibitors, Speakers, Delegates and Foreign Participants for making "Windergy India 2017" a grand success. The three-day Exhibition covered a space of 3500 sqm with 150 stalls and participation of 10 countries. The foot fall was over 3000 and of quality. The two-day Conference had over 70 speakers and over 700 delegates and the sessions were interactive in nature. Recommendations of the deliberations will be presented to MNRE.

On behalf of IWTMA, we wish to place on record our appreciation to Dr. Ajay Mathur, Director General of TERI and the Chairman of the Organizing Committee for Windergy India 2017 not only for his valuable advice but also for leading the team from the front.

This issue titled "WINDERGY INDIA 2017 Special" details the various sessions and the discussion thereof. Windergy India is a Conference and Exhibition organized by the industry to spread the message of powering the nation differently, "literally from the thin air". We believe in our contribution to combat Climate Change and Global Warming and to save the planet Earth.

MNRE through the Solar Energy Corporation of India (SECI) has floated a second bid for 1000 MW through Wind Power after the first bid for 1000 MW which was concluded at ₹ 3.46/Kwh. Many States are opting for competitive bidding and have announced for Requisition for Supply (RFS) through competitive or reverse bidding. While competitive bidding brings in transparency and competition, the bid price will be finally decided the way water find its level. All stakeholders, be the Government, OEMs, IPPs, DISCOMs, will have to bear in mind the targets set to achieve 60 GW by the year 2022, which translates to 5500 MW per year, on a year on year basis.

The much awaited Goods and Service Tax (GST) is expected to be rolled out from 1st July 2017. We salute the Prime Minister to bring this paradigm shift in tax reforms. We are sure that but everyone is aware that initial teething problems, if any, will settle down to business as usual.

With warm regards,

Sarvesh Kumar
Chairman

International Conference and Exhibition

Inauguration of the Exhibition

25th April 2017, 11.00 am

The three-day Exhibition was formally inaugurated by the Chief Guest, H.E. Mr. Tomasz Kozlowski, EU Ambassador on 25th April 2017 morning, by cutting the ribbon to mark the occasion. The dignitaries who participated in the occasion which included Mr. Chintan Shah, Mr. Ramesh Kymal, Mr. Madhusudan Khemka, Mr. Sarvesh Kumar, Mr. Steve Sawyer signed the pledge towards "Clean Green Power" followed by traditional lamp lighting.

The Chairman, IWTMA, Mr. Sarvesh Kumar, accompanied by other dignitaries and the Chief Guest walked through the various exhibition stalls both in Hall 1 & Hall 2 covering 150 stalls participated by 10 countries.

Arrival of the Chief Guest, H.E. Mr. Tomasz Kozlowski, EU Ambassador

Inauguration of Exhibition - Ribbon Cutting by H.E. Mr. Tomasz Kozlowski

Lighting of the lamp by H.E. Mr. Tomasz Kozlowski

Lighting of the lamp by Ms. Henritte Faergemann, Counselor, Environment Energy and Climate Change, European Union

Mr. Ramesh Kymal, CMD, Gamesa India Renewables Ltd. lighting the lamp.

Pledge on Wind Energy by the Dignitaries

Walking around a few stalls by the Chief Guest and other dignitaries

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Inauguration of the Conference

25th April 2017, 6.00 pm

Mr. Sarvesh Kumar, Chairman - IWTMA welcoming the Chief Guest, Mr. Steve Sawyer, Secretary General, GWEC with the bouquet

Lighting of the lamp by the dignitaries

Welcome Address by Mr. Sarvesh Kumar, Chairman, IWTMA and President and COO, RRB Energy Limited

Address by Mr. Tulsi R. Tanti, Chairman, Suzlon Group

Address by Mr. Ramesh Kymal, Chairman, Gamesa Renewable Pvt. Ltd.

Address by Mr. Madhusudan Khemka, Chairman, ReGen PowerTech Pvt. Ltd.

Conference Theme Presentation by Mr. Chintan Shah, Vice Chairman, IWTMA and President, Suzlon Energy Limited

Delegates Engrossed in listening

RRB ENERGY 25 years SILVER JUBILEE

RRB ENERGY

keeping life alive through innovation

25 years of scintillating crusade in the wind-harvesting sector has given RRB Energy a status par excellence and made it a force to reckon with in the wind harvesting sector. They are also set to bring about the much-needed change in how we perceive & consume energy for a greener tomorrow. Their pioneering in-house R&D leads the market from the front & bolsters their credibility in the global market. A true awakening beckons, and they are paving way for it.

For future of wind harvesting, contact

Telephone: 91-11-40552222,
Website: www.rrbenergy.com
E-mail: pawanshakthi@rrbenergy.com

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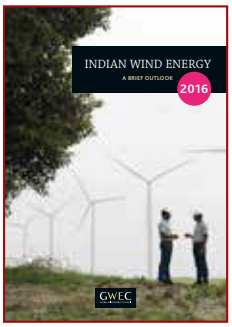
Inauguration of the Conference

25th April 2017, 6.00 pm



Release of "Indian Wind Energy - A Brief Outlook" booklet by Mr. Sumant Sinha, Chairman & CEO, ReNew Power

Address by Mr. Sumant Sinha, Chairman and CEO, ReNew Power Ventures Pvt. Ltd.

Keynote address by the Chief Guest, Mr. Steve Sawyer and brief on Global and Indian Wind Energy Outlook

Vote of Thanks by Mr. D.V. Giri - Secretary General, IWTMA

Delegates and Invitees

Group Photo after Inauguration

A section of the audience at inauguration

Windergy India 2017
Inauguration of the Conference

25th April 2017, 6.00 pm

The two-day Conference was inaugurated on 25th April 2017 evening by Mr. Steve Sawyer, Secretary General, GWEC. Mr. Sarvesh Kumar, Chairman, IWTMA welcomed the dignitaries and traditional lamp lighting was done to mark the occasion. The dignitaries on the stage addressed the gathering which included Mr. Tulsi R. Tanti, Chairman & Managing Director, Suzlon Group; Mr. Ramesh Kymal, Chairman & Managing Director, Gamesa Renewable Pvt. Ltd., Mr. Sumant Sinha, CEO, ReNew Power and Mr. Madhusudan Khemka, Managing Director, ReGen Powertech Pvt. Ltd.

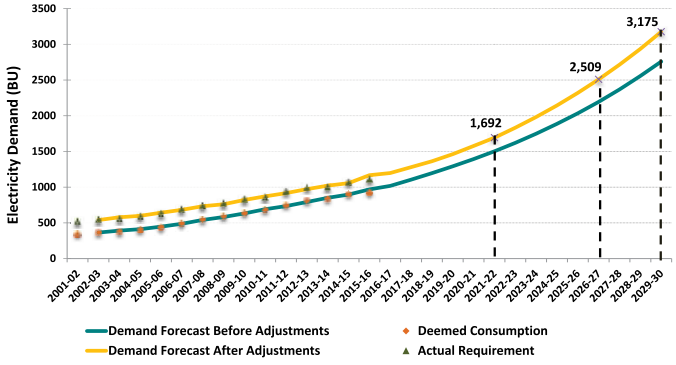
The strong single message by the industry is that Wind Energy is mature with state-of-the-art technology with 9500 MW of manufacturing capacity. The industry is well poised to meet the target of 60 GW by 2022 set by the Government and even go beyond. Several challenges can be turned into opportunities and the speakers spoke on the commitment of Paris Climate Talks.

The two-day conference spread over 10 Sessions and the Conference Content setting was made by Mr. Chintan Shah, Vice Chairman, IWTMA in the absence of Dr. Ajay Mathur, Chairman, Organizing Committee and Director General of TERI. The occasion was marked with a release of book titled "Indian Wind Energy - A Brief Outlook 2016" brought out by GWEC and IWTMA, by Shri Sumant Sinha, CEO, ReNew Power. The keynote address was delivered by Mr. Steve Sawyer spanning the Global Wind Energy Outlook and different scenarios of Indian Wind Energy Outlook which showed optimism for the Indian market.

At the end of the Inauguration of Conference, Vote of thanks was given by Mr. D.V. Giri, Secretary General of the Association followed by National Anthem.

Setting the Theme of the Conference

Wind Energy - 60 GW and beyond
Demand Forecast - All India Level



Growth of Power Sector

- High correlation observed
  - Total power consumption versus GDP and per capita GDP
  - Sectoral power consumption and respective sectoral GDP (industrial and agriculture, etc.)

Electricity demand growth scenario and Installed Capacity

	Generation (BU)		Installed Capacity (GW)	
Years	High RE Scenario	Low RE Scenario	High RE Scenario	Low RE Scenario
2021 - 22	1692	1692	506	457
2026 - 27	2509	2509	802	542
2029 - 30	3175	3175	1185	872

- CAGR of electricity consumption in India - 7.4%

Indian Power Horizon

- 69% of RE installations are from wind energy
- To meet the above demand scenario – the generation mix scenario would be

INSTALLED CAPACITY (GW)						
	High RE Scenario			Low RE Scenario		
	2021 - 22	2026 - 27	2029 - 30	2021 - 22	2026 - 27	2029 - 30
Renewable Energy (Wind+Solar)	160	470	853	110	210	284
Non RE excluding coal	98	114	114	98	114	114
Coal	248	218	218	248	218	474
TOTAL	506	802	1185	457	542	872

Supply Side Scenarios - All India Level up to 2030

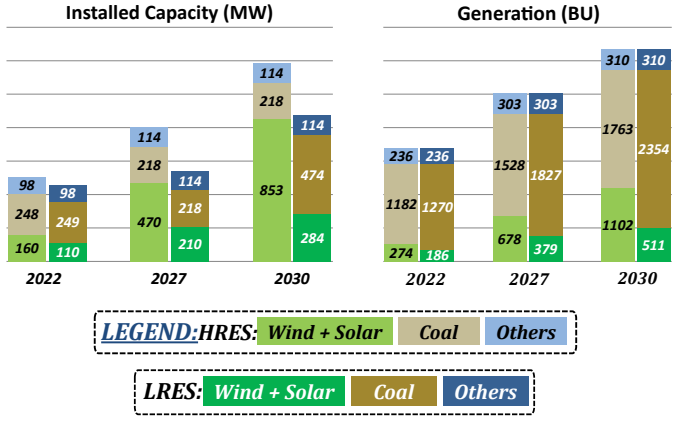
Common Assumptions/Methodology

- PLF/ CUF: Nuclear (75%), Hydro (35%), Gas (22%), Solar (19%), Wind (25%)
- Capacity addition of coal, nuclear, hydro and gas based plants by & large based on draft NEP figures
- Coal based generation to cater to the residual demand left after the capacities of all other sources generate upto their assumed PLFs/ CUFs

Two scenarios considered…

	High Renewable (HRES)	Low Renewable (LRES)
Renewable Capacity Addition	175 GW (2022) 25 GW p.a. thereafter	125 GW (2022) 20 GW p.a. (2022-27) 25 GW p.a (2027-30)
Grid related issues for RE	Resolved by 2027	Not completely resolved
Grid parity for Solar + Storage	Achieved	Not achieved
Unmet demand met by	New RE capacity	Various options available; coal considered

Supply Side Scenarios - HRES & LRES Results



Note: In the HRES, new RE capacity required to meet the unmet demand after 2026 would undergo a downward revision based on the extent of development in storage technologies.

Wind Sector Highlights

- **The new global total at the end of 2015 was 432.9 GW, representing cumulative market growth of more than 17 percent.**
  - Global Wind Power Installations at 54 GW during 2016
- **India**
  - Estimated wind energy potential in the country is 302 GW at 100 meters hub height
  - 32,280MW installed by March 2017
  - 3471.95 MW installed in FY 2015-16 and 5502 MW in 2016-17.
  - INR 25,000 crores (USD 3.73 billion) of total investment made in manufacturing in India
  - Manufacturing capacity of 9,500 MW
  - Export potential of over 2 billion $ per annum

Wind Energy Drivers

- Drivers:
  - CoP21- Commitment: 40% RE in supply mix by 2030
  - Economic growth is one of the demand drivers - GDP
    - ✧ House Hold Connectivity and 24x7 power availability
    - ✧ E-mobility (Electric Vehicles) and electrification of transport sector
- Wind, over the past twenty five years, has proved itself to be scalable, cost effective, source of Power Generation in India, with a bag of matured turbine technologies.

Conference Theme - Growth Focus

- Strong policy and regulatory support
- Infrastructure planning
- Off-shore wind development
- Technology innovations
- Make in India – Export potential
- Cost and Variability to be addressed
  - Renewables (wind) would achieve grid parity and would become dispatchable power. i.e. Wind + Storage/balancing.
  - Price of dispatchable Wind Power would be about ₹ 5/kWh and would be competitive with price of coal based electricity.


Vestas
What's the value of a proven platform?
+81 GW installed in 75 countries
Vestas 2MW platform is one of the most trusted turbines in the wind industry, built on proven and reliable technology. The new V110-2.0MW™ IEC IIIA is our latest addition to the 2MW platform - with its 54 m blades, this turbine delivers a notable rotor-to-generator ratio producing a remarkable capacity and yield at low- and medium-wind sites. A perfect fit for Indian wind conditions.
Since 2002, we have installed more than 18,000 turbines from our 2MW platform worldwide – a vote of confidence and a track record confirming with hard numbers that we are delivering on our promise of business case certainty. After just a few months of operation, the 2 MW platform operates consistently with a lost production factor below 2% worldwide. In addition, new upgrades to the turbine can increase annual energy production by up to 13% compared to V100-1.8/2.0MW™.
With the Vestas 2MW platform we ensure competitive cost of energy and world-leading business case certainty. This translates into high returns with no risks.
One of the world's most proven turbines just got better!
To learn more about Vestas, please visit www.vestas.com
For any enquiry please contact response@vestas.com
Wind. It means the world to us.™

Windergy India 2017
International Conference and Exhibition

Windergy India 2017 International Conference and Exhibition was organized by Indian Wind Turbine Manufacturers Association (IWTMA) and Global Wind Energy Council (GWEC) from 25th to 27th April 2017 at The Ashok, New Delhi. This is the most prestigious venue for the national and international events in Delhi.

Global Wind Energy Outlook

Global Wind Energy Council (GWEC) brought out the Global Wind Energy Outlook 2016 on the occasion of Windergy India 2017. It provides a comprehensive overview of the global industry at a moment in time; the industry now present in more than 80 countries, 29 of which have more than 1000 MW installed, and 9 with more than 10000 MW. The information contained in this report- market data, profiles and analysis, etc. was collected from different sources.

Indian Wind Energy - A Brief Outlook

IWTMA and GWEC brought out the Indian Wind Energy Outlook 2016. This report is an attempt to summarise the current state of the Indian wind market for the members of the industry, policy makers and participants alike to understand the market opportunities. In addition, it gives us insights into the challenges going forward and offers suggestions for overcoming remaining hurdles for wind power development. It was released by Mr. Sumant Sinha, Chairman and CEO, ReNew Power during the event.

Indian Wind Power Magazine: Windergy Special Issue

The Windergy Special (April - May 2017) issue of Indian Wind Power magazine – on the theme "Positioning Wind Energy for the Future" was brought out for the event. The issue has the articles from the prominent personalities of wind industry in the world. The issue was distributed to all the delegates and the exhibitors.

Exhibitors Directory and Conference Souvenir

An Exhibitors Directory and Conference Souvenir was also brought out during the event giving details of all the companies who have exhibited their products and services at the exhibition. This also contains the bio-data of all the speakers and the profile of the exhibitors besides messages from the sector stalwarts.

The Exhibition and Visitors

The exhibition was set up at the front lawn and swimming pool side hard court of the venue in over 3000 square meter of the stall area. 150 exhibitors from over 10 countries exhibited their products and services at the exhibition. Tens of the thousands visitors thronged the exhibition on all the three days.

Delegates

The conference was attended by over 700 delegates from various fields like OEMs, Component Manufacturers, Government Authorities, IPPs, Regulators, Consultancy Firms, Electricity Transmission Companies, Auditors, Investment Companies, Energy Institute, etc.

Conference, Sessions and Speakers

Besides the Inaugural and Valedictory sessions, the Windergy India 2017 arranged 10 sessions with 70 eminent speakers from all over the world in the field of Wind Energy, Hon. Minister, OEMs, Component Manufacturers, Government Authorities, IPPs, Regulators, Consultancy Firms, Electric Transmission Companies, Auditors and Investment Institutions, etc. The detail of the sessions and speakers is given in the further pages.

Programme at the Sidelines of the Conference and Exhibition

A number of programs were conducted at the sidelines of the conference and exhibition by IWTMA, GWEC and other institutions.

GWEC Media Interaction

GWEC Secretary General Mr. Steve Sawyer, IWTMA Chairman Mr. Sarvesh Kumar and Secretary General Mr. D. V. Giri and interacted with the national and international media on the objectives of the conference and exhibition. Mr. Sawyer also presented the major points covered the Global Wind Energy Outlook brought out during the event. The media covered the questions about the scope of wind power in India. The news were published in over 30 newspapers and was also covered by TV and electronic media.

Exhibitors Night

Exhibitor's night was celebrated by all the exhibitors on 25th April 2017 hosted by IWTMA.

Networking Dinner

A Networking Dinner was organized on the 25th April 2017 evening at the Banquet Hall of The Ashok. This was attended by major IPP's, OEM's, Speakers and Government Officials, hosted by ReNew Power.

Presentation by Skill Council for Green Jobs

Mr. Tanmay Bishnoi, Head - Standards and Research, Skill Council for Green Jobs made a presentation on Skill Gap in Wind Energy Sector Topic 'Training and Skill Development in Wind Energy Sector' at Hall No. 294 on 26th April 2017.

Presentation by NAWIND

NAWIND members made the presentations and discussions to the audience on various topics at their stall.

Shell Technology Forum

Mr. Akhil Jha, CTO, Shell Lubricants India; Mr. Siva Kasturi, Asia Pacific Regional OEM Manager, Shell Global Lubricants; Mr. Narendra Somoshi, Vice President, Head, O&M, INOX Wind; Mr DV Giri, Chief Guest, Secretary General, IWTMA and other spoke on various aspects of technology at the Shell Lubricants' 1st Wind Technology Forum in New Delhi.

SKF Product Launch

On 26th April 2017 afternoon, SKF's Wind SRB -specialized Spherical Roller Bearing for Wind Industry and IMX-8, the health monitoring device to monitor the health of the wind turbines system was launched at their stall by Mr. Amit Kansal, CEO and Managing Director, Senvion India Limited.

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Session 1: Indian Power Horizon Enriched by Wind

Wednesday - 26th April 2017: 10.00 am to 11.30 am

Chair	**Mr. Gireesh B Pradhan** Chairperson and Chief Executive Central Electricity Regulatory Commission
Theme Presenter	**Mr. Suvojoy Sengupta** Partner, McKinsey India
Panellists	**Mr. Tulsi R. Tanti** Chairman & Managing Director Suzlon Group **Mr. Rajeev Kapoor,** IAS Secretary, MNRE **Mr. Madhusudan Khemka** Managing Director ReGen Powertech Pvt. Ltd. **Mr. Ramesh Kymal** Chairman & Managing Director Gamesa Renewable Pvt. Ltd. **Mr. Sumant Sinha** Chairman & CEO, Renew Power **Mr. S.K. Soonee,** Advisor, POSOCO **Mr. Sunil Jain,** Chief Executive Officer Hero Future Energies Pvt. Ltd.

Synopsis

Indian power sector in transition – Renewable Energy Sources can reach 17% of output by 2022. Wind has recorded stellar growth recently while attracting investors.

Wind industry well placed with headroom for further growth – however, returns being compressed

- Intensified competition and falling tariffs
- Continued concern on DISCOMs health and payment delays
- Curtailment and grid integration

Opportunities for players

- Continue to pursue newer technologies
- O&M excellence espousing advanced analytics
- Commercial optimization and financing

Priorities for policy and regulation

- Strengthen forecasting and scheduling
- Accelerate market development: Ancillary Services, availability
- Ensuring transmission availability for intra and interstate flows

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Session 2: Make in India - Manufacturing Opportunities

Wednesday, 26th April 2017: 11.45 am to 01.15 pm

Chair	**Mr. Rakesh Bakshi** Chairman & Managing Director RRB Energy Ltd.
Theme Presenter	**Mr. Shishir Joshipura** Managing Director, SKF India
Panellists	**Mr. Morten Dyrholm** Managing Director, Vestas **Mr. V. Lakshmikumaran** Managing Partner Lakshmikumaran & Sridharan **Mr. K.V. Suresh** Head, ZF Wind Power **Mr. Manuj Khurana** Asst. Vice President, Invest India **Mr. Alok Gupta** Managing Director, Reichhold

Why Make in India

- Underserved market
- Demographic dividend - Development of Local Markets
- Cost Advantage

Opportunity

- Manufacturing 4.0
- Increasingly crowded in low cost positioning
- Innovation for masses at low cost

Building Sustainable Competitiveness - Agenda for Government

- Ease regulatory Burden
- Build Infrastructure
- Establish common market

Building Sustainable Competitiveness - Agenda for Private Sector

- Develop R&D base
- Create - High skill footprint, Low cost innovation
- Fortify - Quality foundation

Make the most out of your maintenance resources

Given the operating conditions a wind turbine faces over a typical 20-year service life, maintenance problems aren't a question of "if," but "when".

When inevitable maintenance problems occur, farms are faced with the prospect of exorbitant crane mobilization costs, lost energy production and soaring costs per kilowatt-hour. And to make matters worse, spare parts for wind turbines are very difficult to come by in this rapidly expanding industry.

SKF can help.

By enabling operators to monitor and track deteriorating component conditions in real-time, SKF solutions enable maintenance decisions to be based on actual machine conditions, rather than arbitrary maintenance schedules.

WindCon

Remote diagnostics centre

System24

WindLub

Remanufacturing of slewing bearings

Hybrid & INSOCOAT bearings

For these and more solutions,
visit www.skf.com/wind or contact:

Abhijit Kulkarni
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abhijit.kulkarni@skf.com

Vinay Gaonkar
Manager, Application Engineering, Industrial Markets, SKF India
vinay.gaonkar@skf.com

The Power of Knowledge Engineering

Session 3: Regulatory Round-up and Legal Landscape - What Needs to Change?

Wednesday, 26th April 2017: 11.45 am - 01.15 pm

Chair	**Mr. Pramod Deo** Former Chairperson Central Electricity Regulatory Commission
Theme Presenter	**Mr. Amit Kapur** Partner, J. Sagar Associates
Panellists	**Mr. Rakesh Nath** Technical Member (Retd.), Appellate Tribunal for Electricity **Mr. Mahesh Vipradas** Vice President, Sembcorp India **Mr. Hemant Sahai** Founding Partner, HSA Advocates **Mr. Bhanu Pratap Yadav** Joint Secretary, Ministry of New and Renewable Energy

Synopsis

- Purchase obligations are very critical for achieving the ambitious target of 175 GW of which 60 GW is wind. It has been observed that state distribution company approach the state regulator and asked for postponement of the target to next year.
- APTEL has made direction under Section 121 as such postponement is not admissible as long as sufficient Renewable Energy Certificates (RECs) are available in the market. Because of the financial health of state DISCOMS, the first casualty is fulfillment of RPO's.
- Since we are moving to regime of Competitive Bidding, Ministry of Power should issue bidding guidelines as per Section 63 of a draft circulated for guidance and getting inputs from the stakeholders. Legally Ministry of Power shall have to issue bidding guidelines.

Session 4: Emerging Opportunities – Offshore and Competitive Bidding

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Wednesday, 26th April 2017: 2.15 pm to 3.15 pm

Chair	**Mr. Steve Sawyer** Secretary General Global Wind Energy Council
Theme Presenter	**Mr. Sabyasachi Majumdar** Vice President, ICRA Limited

Panellists	**Mr. Balram Mehta** Vice President Renew Power Ventures Pvt. Ltd. **Mr. V. Subramanian** Former Secretary, MNRE, CEO & Chairman, Indian Wind Energy Association **Mr. Ashvini Kumar** Managing Director, SECI **Mr. Ranjit Mene** President Offshore, Senvion **Dr. Rajib K. Mishra** Director BD Power Trading Corporation of India Ltd.

Synopsis

- Demand outlook is positive driven by cost economics
- RPO enforcement is a key issue
- Tariff regime likely to move to Competitive Bidding
- Offshore wind rapidly becoming affordable in Europe
- Offshore wind is still nascent stage outside Europe
- Govt support may be required to kick start business

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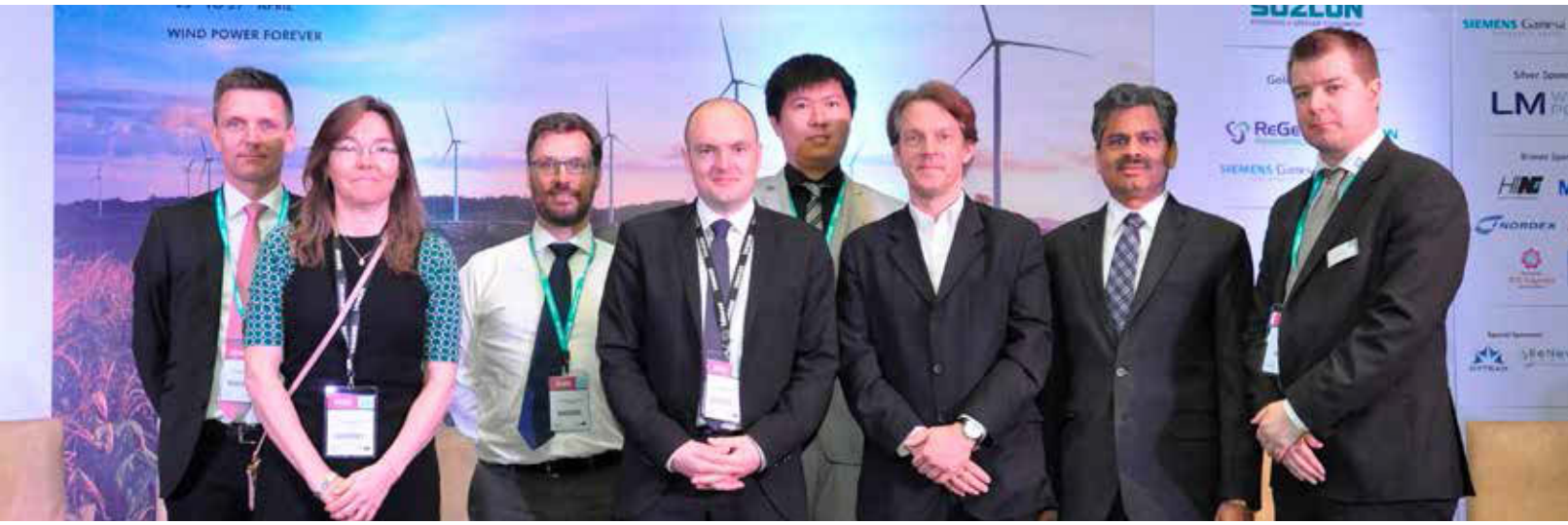
Session 5: Innovation & Global Technology Trends

Wednesday - 26th April 2017: 2.15 pm to 3.15 pm



Chair	**Mr. Morten Dyrholm** Chairman, GWEC
Theme Presenter	**Mr. Bo Li** Business Analyst, MAKE Consulting, China
Panellists	**Mr. Jourdain Christian** Senior Service Marketing Manager, Gamesa, Spain **Ms. Lise Backer** Senior Specialist, Vestas **Mr. Mahesh Palashikar** CEO-Asia Pacific Region, GE Renewable Energy **Mr. Soren Hoffer** Vice President - Sales & Marketing, LM Wind Power **Mr. Mathias Steck** Vice President, DNV-GL **Mr. Antti Turunen** Head of Global Service, ZF Wind

Synopsis

- 2016 saw increased focus in growing rotors and towers in the 3 MW class
- Turbine Manufacturer (OEM) acquisitions present the biggest impact on global technology trends
- Blades and MW ratings expected to continue growing in every global region
- Many technologies continue evolutionary pace, while others experiencing innovation boom
- Consolidation is occurring but industry is still more intensely competitive than a decade ago
- High cost of Balance of Plant (BOP) and performance gains makes 3 MW more attractive
- Lower than 2 MW class due to drop substantially outside of select Asian markets
- Modular product strategies have enabled strategic component re-use across products
- Increased cost of Balance of Plant is driving preference for larger turbines in EU and offshore
- Cost-out focus will remain on blades and towers in order to reduce LCOE
- Asia Pacific remains the last stronghold for the 1.5 MW class, despite 2 MW gains
- Europe and the Americas to see substantial growth in 3 MW class installations
- Segmented blades and cost effective taller towers are critical to onshore turbine growth

Complete Solutions for Yaw & Pitch Control

Bonfiglioli is a leading provider of complete packages for the wind industry that seamlessly control energy generation, from rotor blade positioning with a pitch drive to nacelle orientation with a yaw drive. Working closely with customers, Bonfiglioli designs and manufactures a series of specialized wind turbine gearboxes and inverters that deliver reliable, superior performance.

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Bonfiglioli
Forever Forward

Session 6: Grid Integration & Planning

Wednesday - 26th April 2017: 3.30 pm to 5.00 pm

Chair	**Mr. KVS Baba** CEO, Power System Operation Corporation
Theme Presenter	**Mr. Peter Jorgensen** Director, Energinet DK
Panellists	**Mr. B. B. Mehta** Chief Engineer, SLDC Gujarat **Mr. Pankaj Batra** Member, Central Electricity Authority **Mr. Markus Wypior** Director, GIZ, Indo-German Energy Programme, Dy. Director Green Energy Corridors **Mr. Dinesh Majithia** Vice President, Orange Renewable **Mr. Ajit Pandit** Director, Idam

Synopsis

- For integration of renewables and planning, all systems are in place. The act has the required provisions.
- Required regulations are in place at Central level to take care inter-regional and inter-state exchanges. For the integration to be effective, the STUs and SERCs have to take matching steps in adopting the regulations at State level and in their implementation.
- Flexibility is precursor for desired integration. Central regulations with respect to operation of Thermal generators at Technical minimum need to be notified in the gazette at the earliest.
- Forecasting, scheduling, accounting and settlement in every state needs to be implemented in accordance with FOR framework in expeditious manner (Implementation of SAMAST report).
- New developers to follow necessary inter connectivity standards.
- States have to provide adequate reserves in accordance with latest amendment of IEGC.
- Electricity market to be vibrant, necessary frame work is available and all stakeholders to make use of it and State regulators need to be more forth coming in encouraging the same.

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Session 7: Exports from India

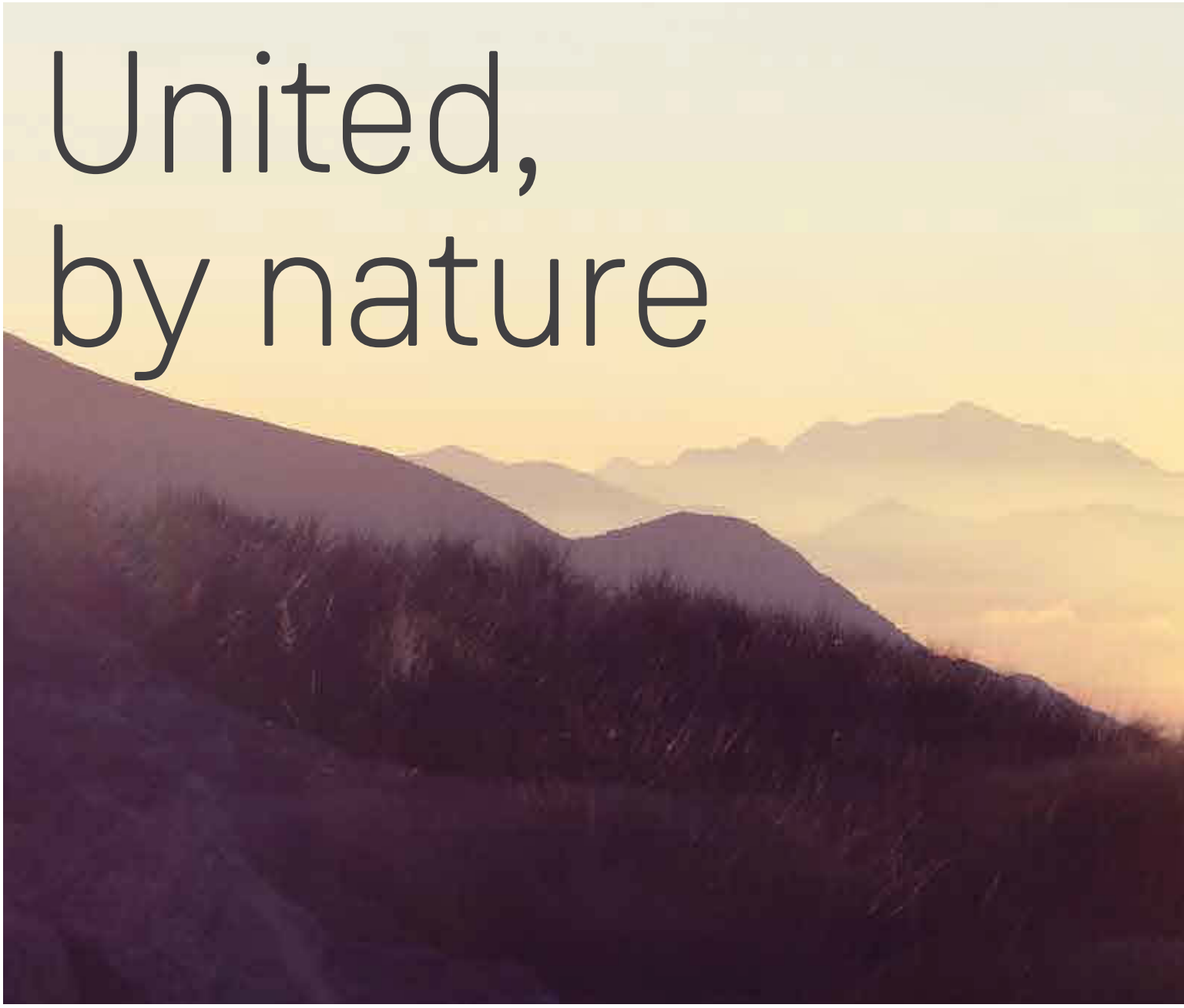
Thursday, 27th April 2017: 10.00 am to 11.30 am

Chair	**Mr. David Rasquinha** Managing Director (Additional Charge) EXIM Bank
Theme Presenter	**Mr. Chintan Shah** President, Suzlon Energy Ltd
Panellists	**Mr. Steve Sawyer** Secretary General, GWEC **Mr. Nagaraja Rao** Asia Regional Coordinator, CTI - PFAN **Mr. Joseph Chaly** Executive Director and President ReGen Powertech Pvt. Ltd. **Mr. N. Ravichandran** Executive Vice President Gamesa Renewable Pvt. Ltd.

Synopsis

- The Indian exports for components of renewable energy stood at US$ 3.3 billion (1.1% of global exports) in 2015, with exports being US$ 0.97 billion, US$ 1.7 billion and US$ 0.65 billion for components of solar energy, wind energy and biomass energy, respectively. Hence share of wind energy components from India stood at 1.7%.
- If India is to develop its own capacity, let alone pursue export opportunities, it must establish an environmental job market that is sufficient to keep pace with the growing wind power industry.
  - India needs more trained engineers to build farms and carry out operations and maintenance, but skilled production engineers and technicians are also needed to fortify the supply chain.
  - Over the next few years, many of India's wind farms will be liable for repowering - dismantling older turbines for replacement with larger, more modern machines. A potential export opportunity could be to recondition these older turbines and supply them to emerging wind power markets, at reduced costs and warranties.
  - Simultaneously, India can leverage its numerous trade links and agreements to supply many of these nations.
- According to Indian Wind Turbine Manufacturers Association (IWTMA), the wind manufacturing industry had the capacity to produce equipment for 10 GW of generation, but domestic demand was only about 3-4 GW. "In the absence of proper atmosphere for export, our potential is getting wasted. The government needs to create the platform to enable the industry to export.
- Apart from commercial banks and bond issues, the other major source of debt for renewable power assets is borrowing directly from the world's array of national and multilateral development banks.

United, by nature



For close to four decades, Siemens Wind Power and Gamesa have been harnessing the immense power of nature to provide people and communities around the world with clean, affordable and reliable power. They have long been united by a common vision.

Now, two industry leaders have united their businesses, to better respond to the energy challenges of tomorrow and to provide lasting value to their many stakeholders today.

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Session 8: Wind & Solar Energy - Operating Together

Thursday - 27th April 2017: 11.45 am to 1.00 pm

Chair	**Ms. Varsha Joshi** Secretary, Power, Government of Delhi
Theme Presenter	**Mr. Balawant Joshi** Managing Director, IDAM
Panellists	**Mr. Madhusudan Khemka** Managing Director ReGen Powertech Pvt. Ltd. **Mr. Mahesh Makhija** Director – Renewables, CLP Wind Farms India Private Limited **Mr. Shyam Ragupathy** Director, Strategy for IESA & CES **Mr. Vishal Pandya** Co-Founder and Director, REConnect Energy

Synopsis

- Wind and solar generation is complimentary due to their respective generation profile
- Utilities and system operators need to work with wind and solar generators to develop appropriate operational policies to meet camping requirement
- Solar-wind hybrid results in reduction of costs to both the operators and developers thereby reducing burden on consumers.
- Clear policy and tariff framework required for wind solar hybrid.
- Cost of storage system is coming down rapidly and would become competitive in coming years.

Session 9: State Level Challenges & Way Forward

Thursday, 27th April 2017: 2.00 pm to 3.00 pm

Chair	**Mr. M.R. Srinivasa Murthy** Former Chairman, KERC
Theme Presenter	**Mr. Glen Reccani** Country Managing Director-Acciona Wind Energy, India
Panellists	**Mr. D.G. Kamath** VP Marketing, Gamesa Renewable India Ltd. **Mr. U.B. Reddy** Managing Director, Enerfra Projects (India) Limited **Mr. Ranjit Gupta** Managing Director, Ostro Energy

Synopsis

- Off taker risk - health of state utilities leading to payment delays to be avoided
- Policy certainty – long-term policies needed, frequent changes to be avoided, retrospective changes to be avoided
- Transmission infrastructure to be built to catch up well projected renewable growth
- Wind and solar PV to be equally encouraged to meet growth targets
- Easing of private land acquisition process and conversion from agricultural to non-agriculture land

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Session 10: Wind and Sustainability

Thursday - 27th April 2017: 3.00 pm to 4.00 pm

Chair	**Dr. Ajay Mathur** Director General, The Energy & Resource Institute
Theme Presenter	**Mr. Steve Sawyer** Secretary General, GWEC
Panellists	**Dr. Arunabh Ghosh** CEEW **Mr. Chintan Shah** President, Suzlon Energy Ltd. **Mr. KS Venkatagiri,** CII **Ms. Namita Vikas** Director Sustainability, Yes Bank

Synopsis

- Sustainable Energy System depends on market structures which accurately reflect: Cost of CO_2, Cost of water, Cost of integration, Cost of (lack of) SOX, NOX, etc.
  - Effect on balance of payments/foreign exchange
  - Effect on employment and local economic development
  - Effect of price stability
  - Costs of fossil fuel subsidies
  - Costs of nuclear insurance and decommissioning costs
  - 29 markets with more than 1,000 MW; 9 with more than 10,000 MW; Proliferation of new markets in Africa, Asia and Latin America.
- Technology evolution continues, but incrementally, not spectacularly, except perhaps in offshore, where we now have 9 MW machines...'double digit' turbines soon.
- Costs continue to come down and wind is the cheapest way to add capacity in a growing number of markets in Africa, Asia and Latin America, as well as in the US and Canada. Offshore costs dropped spectacularly in 2016.
- ~4% of global electricity supply now, should be 6-8% by 2020, 18-20% by 2030, around 1/3 by 2050 if we are to get to grips with the climate problem.

Valedictory

Thursday - 27th April 2017: 4.00 pm to 5.00 pm

Shri Suresh Prabhu, Hon'ble Minister for Railways was the Chief Guest at the Valedictory Function on 27th April 2017.

The Hon'ble Minister highlighted the importance of Renewable Energy as a "Clean Green Power and Energy" of the future and trends in technology inclusive of electric vehicles by 2030.

Railways will play an active role in promotion of Renewable Energy in purchase of power. Shri Suresh Prabhu was happy to note that the industry is not only producing "Clean Green Power" but its contribution extended to a positive impact on rural economy and providing rural employment.

The Government is committed towards combating Climate Change and Global Warming and encourages Renewable Energy with its high potential and targets set by the Government of 175 GW by 2022 from RE sources.

Shri Suresh Prabhu, Hon. Minister for Railways arriving at the venue

Mr. Sarvesh Kumar, Chairman - IWTMA welcoming the Hon'ble Minister

Summing up of the Conference by Dr. Ajay Mathur, Director General, TERI

Valedictory Address by Mr. Suresh Prabhu, Hon'ble Minister for Railways

The delegates at the Convention Hall

Vote of thanks by Mr. D.V. Giri, Secretary General - IWTMA

National Anthem

Abstract Presentations

The abstract on various subjects of wind power were invited from the specialists. During the conference in total 45 presentations were made (21 oral and 24 flash) at Hall no. 294. The topics of the presentations were Grid Management, Logistics and Transportation, Operations and Maintenance, Research & Development and Wind Resource Forecasting judged by a panel of experts.

Dr. S. Gomathynayagam, Director General, NIWE (Retd.), Mr. Steve Sawyer, Secretary General, GWEC and Mr. Vishal Pandya, Director, ReConnect had judged the abstracts.

A participant presenting his Abstract

Mr. N.S. Prasad, TERI and Mr. Senthil Kumar, Director, NIWE, observer for presentations

The audience at the Abstract Presentation

Hon. Railway Minister Shri Suresh Prabhu presenting the Award to Mr. Shankar Jayachandran from Gamesa Renewables Private Limited for Flash Abstract Presentation

Hon. Railway Minister presenting the Award to Mr. Shreeramamoorthy Kella for Flash Abstract Presentation

Hon. Railway Minister presenting the Award to Mr. Kristoffer Qvist Nielsen from KK Wind Solutions, Denmark

Abstract Topics

Topics	Abstracts Received
Grid management	4
Logistics and Transportation	2
Operations and Maintenance	12

Topics	Abstracts Received
Research & Development	18
Wind Resource Forecasting	9
Total	45

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Together, we capture the wind to power a cleaner world

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26th April 2017 - Venue - Suite No. 294	
Presenter Name	**Title**
Oral Presentations	
Dan Bernadett	IEC 61400-12-1: Putting Edition 2 to work for you
Prasad Padman	Improving Turbine Reliability through Component Design Optimization
Arun Kumar KT	Improved Numerical Predictions for Wind Turbine Airfoils
B B Mehta	Capturing Real-Time Data of Renewable Energy for Grid Management
Ramon Lopez Mendizabal	Precast Braced Foundation: Towards a significant CoE reduction from the very base
Martin Rambusch	Increasing AEP with the nacelle-mounted WindEYE LiDAR
Abhay Laxmanrao Waghmare	Risk & Reliability Based Maintenance approach for wind turbine blades
Robert Rawlinson-Smith	Wind farm benchmarking for improved financial performance
Sidharth Jain	State of the art in O&M commercial models by OEM and in-house capabilities of developers globally. Opportunities for Indian players.
Thomas Sorensen	Long-term correction: Facts and Fiction
Jerry Randall	Improved Approaches to Site Finding
Rajnikanth Umakanthan	Comparison of a global fleet of Triton wind profilers to collocated met towers
Vijayant Kumar	Is WRF-LES the right tool for wind resource assessment?
Rajesh Karki	Capacity Credit Assessment of Wind Energy Sources
Krishna Kumar S	Wind Forecasting Digital Twin
Kristoffer Qvist Nielsen	Grid Stability Enhancement by LVRT Retrofitting of Existing Wind and Solar Power Plants

27th April 2017 - Venue - Suite No. 294		
Presenter Name	**Title**	**Topics**
Mathias Hoelzer	TI dependent Power Curve - A new approach to deal with the effects of turbulence	Grid management
Kiran Nair	Smart Monitoring, Big Data, Artificial Intelligence & Cloud Computing; a smarter way to manage your fleet	Research & Development
Chris Garrett	Fast Feeder Vessels for Offshore Wind Installation	Logistics and Transportation
Eneko Sanz	Wind Turbine Scaling: NABRAWIND Solutions	Logistics and Transportation
Flash Presentations		
Lucille Andrade	How can Wind Energy become Environmentally Benign?	Research & Development
Ashish Singh	LM serrations for wind turbine noise reduction	Research & Development
Thirumoorthi & Bharath	Integrated Load Cell for torque measurement and Monitoring of Gearbox	Research & Development
Pranshu Saxena	Driving Innovation while Managing Risks: A Balanced Risk Management Approach for	Research & Development
Sudhansu Bhusan Prusty	Embracing the Challenging Scenarios in Wind Industry by downsizing the Component through dedicated research in structural components of wind turbine Research & Development	
Sudhakar N	Comparison of Wind Turbine Wake models used in Commercial Software to Optimise	Research & Development
Phil Hutchinson	An alternative approach to Synthetic Wind Turbine Gear Oil formulation	Operations and Maintenance

27th April 2017 - Venue - Suite No. 294		
Presenter Name	**Title**	**Topics**
Sagar Kamble	Maintenance and service strategies for aging wind farms	Operations and Maintenance
Shankar Jayachandran	Transforming Wind Farm Operations through Emerging Technologies	Operations and Maintenance
Sagar Kamble	Maintenance and service strategies for aging wind farms	Operations and Maintenance
Akshay Rajeev	Grease lubrication for low speed bearing applications	Operations and Maintenance
Fabrice Drommi	Statistical approach to improve prediction capability of CMS	Operations and Maintenance
K.S.R. Murthy	Estimation of Weibull Parameters using Maximum Likelihood Method for Wind Power Applications	Wind Resource Forecasting
Abhik Kumar Das	Probability based Scenario Analysis and Ramping Correction Factor in Wind Power Generation Forecasting	Wind Resource Forecasting
Aneesh Rajeev	Synchrophasor Applications for Power System with High Penetration of Renewable Energy Generations	Grid Management

Awards for Abstract Presentation

Best Paper Awards were given to two oral presentations and two flesh presentations. The assessment was done by Mr. Shirish Garud, TERI and Mr. Vishal Pandya, Director, Reconnect and Mr. Senthil Kumar, Director, NIWE.

a. Best Paper Awards for Oral Presentation

1. Mr. Martin Rambusch from Windar Photonics on abstract titled: Increasing AEP with the nacelle-mounted WindEYE, LiDAR on Topic - Wind Resource Forecasting.
2. Mr. Kristoffer Qvist Nielsen from KK Wind Solutions, Denmark on the abstract titled: Grid Stability Enhancement by LVRT Retrofitting of Existing Wind and Solar Power Plants on the topic - Grid Management.

b. Best Paper Awards for Flash Presentation

1. Mr. Shankar Jayachandran from Gamesa Renewables Private Limited on the abstract titled: Transforming Wind Farm Operations through Emerging Technologies on the topic-Operations and Maintenance.
2. Mr. Sreeramamurthy Kella from National Institute of Technology, Hamirpur, Himachal Pradesh on the abstract titled: Estimation of Weibull Parameters using Maximum Likelihood Method for Wind Power Applications on the topic - Wind Resource Forecasting.

Snippets on Wind Power

India Ranked Second in Renewable Energy Attractiveness Index

India has moved up to the second position from third position in this year's 'Renewable Energy Country Attractiveness Index' released by EY. China is the first and US in third place in ranking of top 40 countries. This is primarily due to a combination of strong government support and increasingly attractive economics. India continued its upward trend in the index to second position with the government's programme to build 175 GW in renewable energy generation by 2022 and to have renewable energy account for 40 per cent of installed capacity by 2040. In the medium-term, as renewable energy penetration rates increase, the government will have to turn its attention to the ability of India's grid to manage intermittent renewables, especially around the evening peak, when solar availability falls away.

Source: Economic Times: 16th May 2017

Compiled By: **Mr. Abhijit Kulkarni**
Business Unit Head - Energy Segment
SKF India Ltd., Pune and
IWTMA Team

Windergy India 2017 - Photo Feature

Rush at Registration Counters

Release of Global Wind energy Outlook 26.4.2017

Shell Wind Technology Forum Presentations

Presentation at Pavilion

Delegates Engrossed in listening

Listening to the discussion

Exhibition Hall 2 Entrance

Questions by the delegates


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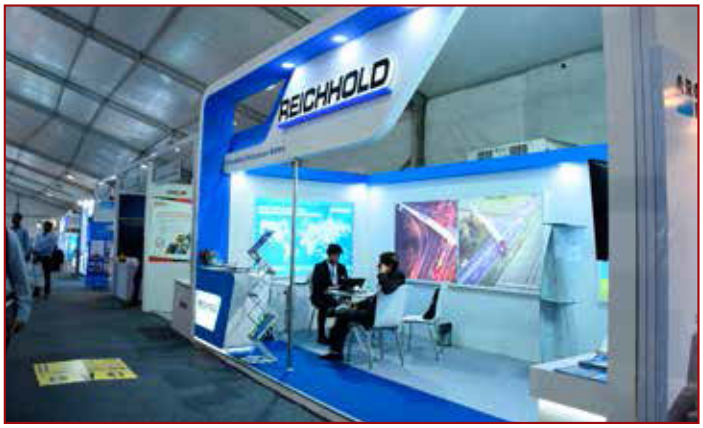
Windergy India 2017 - Exhibition Hall 1

Windergy India 2017 - Exhibition Hall 2



Media Coverage of Windergy India 2017

Business Line

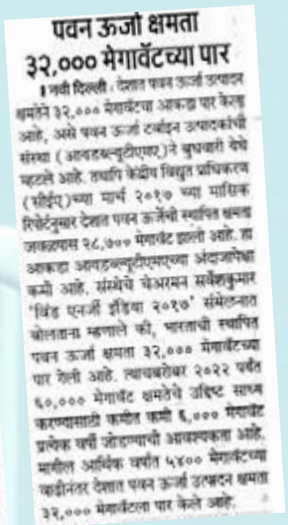
KK Wind Solutions of Denmark enters India

Will make and sell low voltage ride through devices

'Better payment guarantee can bring down wind power tariffs further'

Strong growth outlook attracting new entrants to India's wind turbine sector

India added a record 4,000MW of wind capacity in FY17 topping its 3,000MW target



पवन ऊर्जा क्षमता ३२,००० मेगावॅटच्या पार

विंडएजी इंडिया 2017 दिल्ली में सफलतापूर्वक संपन्न

PERSPECTIVE

Wind Watch

Windergy India 2017 discusses segment challenges and opportunities

पारंपरिक ऊर्जा स्रोतों से हो रहा है सफलतापूर्वक प्रतिस्पधा

वैश्विक पवन ऊर्जा क्षमता होगी 800 गीगावाट

GWEC

Suzlon's wind turbine generator in Gujarat achieves 42% plant load factor

Flying again

Wind capacity additions to resume growth

तेजी से बढ़ेगी पवन ऊर्जा की क्षमता

2016 में दुनिया भर में 90 से अधिक देशों में 54 गीगावाट क्षमता के स्वच्छ पवन ऊर्जा संयंत्र लगाए गए

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NGC

Indian Wind Industry Analytical Score Card for 2016-17 - Key Highlights

Nitin V Raikar
Suzlon Energy Limited, Mumbai

Key Pointers - India

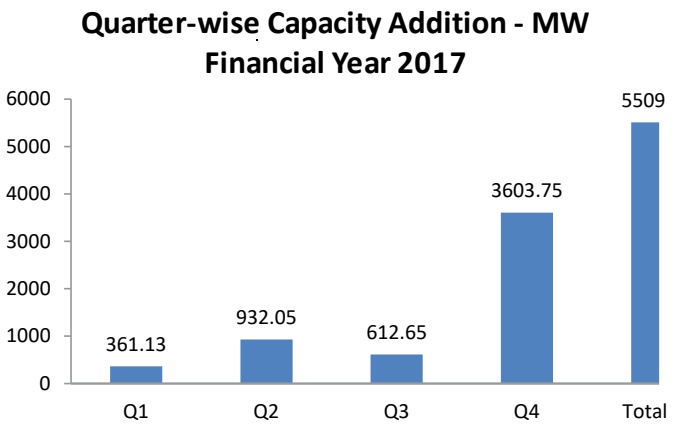
- **Financial year 2017 will go down in the annals of the history of the Indian Wind Energy Industry!!!**
- Record commissioned capacity addition of 5.5 GW in Financial year 2016-17 as against 3.4 GW in Financial Year 2015-16
- This represents an increase of close to 62% for the corresponding period in last fiscal.
- This capacity addition translates to an investment of ~ 5.5 billion USD.
- Cumulative wind power capacity in India surpasses 32 GW Mark and stood at ~32.27 GW as on 31st March 2017
- Cumulative Wind capacity constituted ~56.38% of India's total Grid Interactive Renewable Energy capacity
- Cumulative Wind capacity constituted ~9.80% of India's total installed power capacity from all energy sources
- Cumulative Grid Interactive wind power installations would translate to (on per annum basis)
  - Emission offset of ~69 million tonnes
  - Coal savings of ~52 million tonnes
  - Sulphur Dioxide emission offset of ~ 0.56 million tonnes
  - Tentatively power ~17.5 million number of households
  - Equivalent cars taken off the road/year ~11 million
  - Equivalent number of trees planted per annum ~ 5755 million trees

Key Pointers – States

- Andhra Pradesh leads in capacity addition by commissioning 2179.45 MW followed by Gujarat (1391.65 MW), Karnataka (905.55 MW), MP (356.70 MW), Rajasthan (287.70 MW), Tamil Nadu (256.13 MW), Telangana (23.10 MW) & Kerala (16 MW)
- Installations in all the 9 windy states

State-wise capacity addition for Financial year 2016-17 with comparison to Financial year 2015-16

State	Financial Year 2015-16 (MW)@MNRE	Financial Year 2016-17 (MW)@OEMs	Growth/ Degrowth %
Andhra Pradesh	400.10	2179.45	445
Gujarat	392.40	1391.65	255
Karnataka	230.90	905.55	292
Madhya Pradesh	1261.40	356.70	(-72)
Rajasthan	685.50	287.70	(-58)
Tamil Nadu	158.80	256.13	61
Maharashtra	207.90	93.30	(-55)
Telangana	77.70	23.10	(-70)
Kerala	8.40	16.00	90.5
Total	**3423.10**	**5509.58**	**62.0**



India Wind Energy Installations - Cumulative Installed Capacity Addition (MW) - Upto March 2017

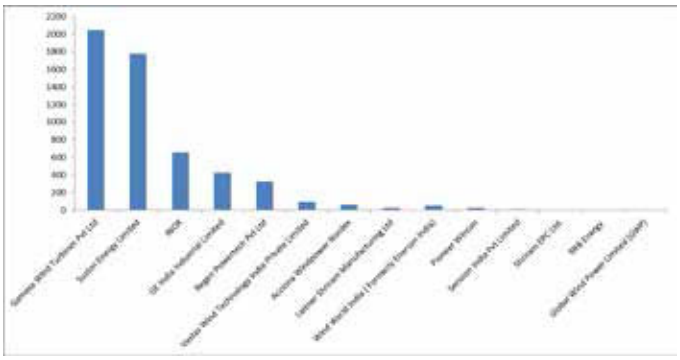
State	Cumulative Installed Capacity (MW)	Percentage of Country Total installed capacity (%)	Wind Resource Potential (MW) @100m a.g.l.	Percentage of Total Estimated Potential (%)	Balance Installable Potential (MW)	Balance Installable as percentage of Installable Wind Potential	Capacity addition target by 2022 (MW)	Potential beyond 2022	Potential beyond 2022 (%)
Tamil Nadu	7870.13	24%	33799.65	11%	25929.52	77%	11900.00	14029.52	7%
Gujarat	5429.45	17%	84431.33	28%	79001.88	94%	8800.00	70201.88	33%
Maharashtra	4752.00	15%	45394.34	15%	40642.34	90%	7600.00	33042.34	16%
Rajasthan	4280.40	13%	18770.49	6%	14490.09	77%	8600.00	5890.09	3%
Karnataka	3774.85	12%	55857.36	18%	52082.51	93%	6200.00	45882.51	22%
Andhra Pradesh	3610.95	11%	44228.60	15%	40617.65	92%	8100.00	32517.65	15%
Madhya Pradesh	2497.80	8%	10483.88	3%	7986.08	76%	6200.00	1786.08	1%
Telangana	100.80	0.31%	4244.29	1%	4143.49	98%	2000.00	2143.49	1%
Kerala	59.50	0.18%	1699.5	61%	1640.06	96%		1640.06	1%
Others	4.30	0.01%	3341.99	1%	3337.69	100%	600.00	2737.69	1%
Total	32380.18	100%	302251.49	100%	269871.31	89%	60000.00	209871.31	100%

Key Highlights

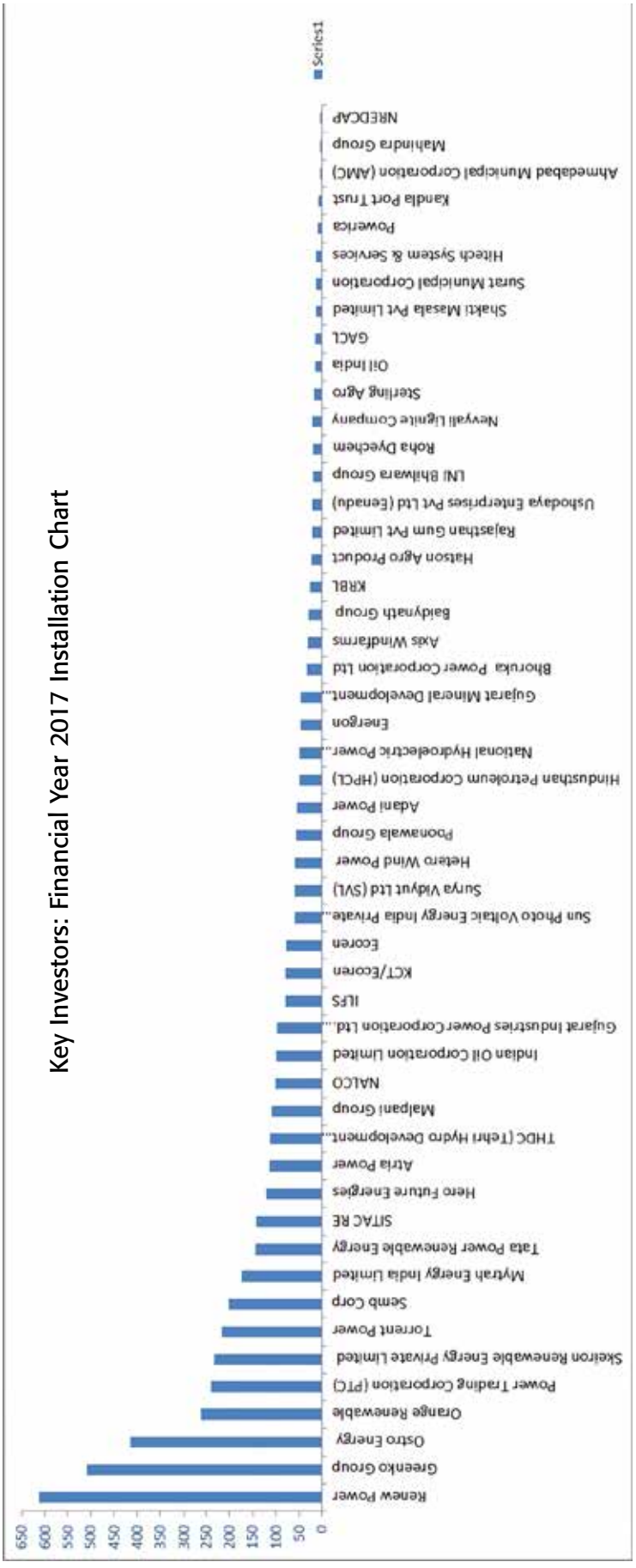
- The top 7 wind states account for 99.5% of the total installed cumulative capacity
- The country's total estimated wind power potential as assessed by NIWE is 302.25 GW out of which 32.27 GW has been installed as of 31st March 2017
- Gujarat leads in Wind Resource Assessment with an estimated potential of 84.43 GW, followed by Karnataka (55.85 GW), Maharashtra (45.39 GW), AP (44.22 GW), Tamil Nadu (33.79 GW), Rajasthan (18.77 GW) & MP (10.48 GW)
- Potential post completion of 2022 targets: Gujarat leads with potential of 71.59 GW, followed by Karnataka (46.78 GW), Andhra Pradesh (34.69 GW), Maharashtra (33.13 GW), Tamil Nadu (14.28 GW) and Rajasthan (6.17 GW)
- Government of India targeted wind capacity addition - 60 GW : TN leads in target addition of 11.90 GW, followed by Gujarat (8.80 GW), Rajasthan (8.60 GW), Andhra Pradesh (8.10 GW), Maharashtra (7.60 GW), Karnataka (6.20 GW) & MP (6.20 GW)
- Potential post completion of 2022 targets: Gujarat leads with potential of 71.59 GW, followed by Karnataka (46.78 GW), Andhra Pradesh (34.69 GW), Maharashtra (33.13 GW), Tamil Nadu (14.28 GW) and Rajasthan (6.17 GW)

Key Pointers – Original Equipment Manufacturers (OEM)

OEM Installations for Financial Year 2016-17 (MW)



- Total number of Original Equipment Manufacturers (OEMs) who added capacity: 14
- Newest OEMs entrants who added capacity – Nordex Acciona & Senvion
- The top 5 OEMs (who added capacity exceeding 100 MW each) constituted ~95% of the total installed capacity
  - Gamesa Renewable Pvt Limited
  - Suzlon Energy Limited
  - Inox Wind Limited
  - GE India Industrial Pvt Limited
  - ReGen Powertech Pvt Limited



- Top OEMs who have a cumulative installation base exceeding 1000 MW or 1GW in India –
  - Suzlon Energy Limited - ~11.30 GW
  - Wind World (India) Limited ~4.8 GW
  - Gamesa Renewable Pvt Limited ~ 4.8 GW
  - Vestas Wind +3.0 GW (including Vestas turbines of RRB Energy)
  - ReGen Powertech Pvt Limited ~2.2 GW
  - Inox Wind Limited ~2.18 GW

Key Pointers – Product & Technology

- Suzlon prototype S111 120m HH achieves a record 42% PLF
- A total of 2860 WTGs of different make and type were installed and commissioned
- Average turbine size increases to 1.93 MW from 1.71 MW in the preceding Financial year 2015-16
- ReGen Powertech successfully proto commissions its new products – 2.0MW & 2.8 MW rated capacity
- Gamesa debuts its G114 2.0 MW with commercial scale commissioning in this fiscal
- GE debuts its 2.3 MW 116 RD in this fiscal
- Acciona launches its AW 125 RD 3.0 MW in India by maiden commissioning a 60 MW project in Karnataka

Classification by Drive train topology

Drive Train Topologies Share for Financial Year 2016-17		
Drive Train Topology	% of total MW installed	% of total nos. of WTGs installed
Geared Drive Train	93.16%	90.21%
Direct Drive Train	6.84%	9.79%
Geared Drive train topology continues to dominate		

Key Pointers – Product Size & Range

Product Class Segmentation for Financial Year 2016-17					
Product Size (Range)		No. of WTGs	% of total WTGs	MW	% of total MW
"Mainstream"	< 1500 - 3000 kW	2719	95.07%	5406.20	98.12%
"Megawatt"	< 751 - 1499 kW	87	3.04%	70.75	1.28%
"Small WTGs"	< 750 kW	54	1.89%	32.63	0.59%
Total		2860		5509.58	
Average Rated Capacity (MW)		1.93			

ENGINEERED PRODUCTS FOR GREEN ENERGY

Pioneers in Wind Turbine Gearbox, Drives, Casted/ Forged / Mechanical Components and It's related services

DHHI---International leading components supplier for wind turbines, more than 30,000 wind turbines are operating with DHHI products worldwide, ranging from 225KW to 6MW.

Products---Main Gearbox, Hub, Main Frame, Shrink disc, Lube system, Pitch & Yaw drives, Yaw rims, Slew Bearings, Hydraulic system, Brakes.

Design---R&D center in Germany and China.

Service---"Where the products sold, where the service goes", service setup in India, Germany, Australia and Brazil.

Aim---Providing reliable, excellent quality products and service to the esteemed wind market customers.

Target---Have a better future for next generations by providing more contribution to the green energy worldwide.

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19, K.G. Marg, New Delhi – 110001, India
Mobile : 91-7042889767 / 7042882470
Email : info@dhhiindia.com

Key Pointers – Investor Class Segmentation

Investor Class Segmentation for Financial Year 2016-17		
Investor Class	Installed Capacity (MW)	% of total MW installed
Independent Power Producers (IPPs)	3320.20	60.26
Public Sector Units	871.50	15.82
Corporate + SME Investors	897.88	16.30
Utilities (State & Private)	420.00	7.62
Total	5509.58	

Key Policy and Regulatory Announcements – Financial year 2017

Central

- CERC announces new Floor price and Forbearance price for REC Framework – **28th February 2017**
- CERC publishes Draft National Electricity Plan – **December 2016**
- MNRE releases Procedure to apply for inclusion of a Wind Turbine Model in the Revised List of Models and Manufacturers of Wind Turbines (RLMM)
- MNRE releases Guidelines for Development of Onshore Wind Power Projects – **22nd October 2016**
- MNRE releases Guidelines for implementation of Scheme for setting up of 1000 MW ISTS - connected Wind Power Projects – **22nd October 2016**
- Ministry of Power (MoP) releases order wherein it exempts the inter-state transmission charges for wind and solar projects for 25 years from respective commissioning – **30th September 2016**
- MNRE releases Policy for Repowering of the Wind Power Projects - **05th August 2016**
- Ministry of Power (MoP) declared the national RPO trajectory – **22nd July 2016**
- MNRE accords sanction for the Scheme for setting up of 1000 MW CTU-connected Wind Power Projects – **14th June 2016**
- MNRE releases Draft National Wind Solar Hybrid Policy – **June 2016**
- CERC published the 4th Amendment to REC regulations - **30th March 2016**

State

- Andhra Pradesh Electricity Regulatory Commission (APERC) has released RPO percentages for the years 2017-22 – **31st March 2017**
- APERC notifies the generic preferential tariff applicable from 01-04-2017 to 31-03-2018 in respect of Wind Power Projects in the State of Andhra Pradesh – **30th March 2017**
- Karnataka defers implementation of F&S Regulation to **1st June 2017**
- Gujarat Electricity Regulatory Commission (GERC) in its order dated **1st October 2016** has computed the additional surcharge payable by the Open Access Consumers for the control period of 1st October 2016 to 31st March 2017
- Andhra Pradesh has notified its Renewable Power Purchase Obligation and its Compliance, regulations which will be effective from April 17, 2017 – **09th September 2016**
- Govt. of Gujarat announces Gujarat Wind Power Policy 2016 – **02nd August 2016**
- KERC released the notification for DSM regulation on Forecasting and Scheduling for wind and solar in Karnataka – **31st May 2016**
- Tamil Nadu Electricity Regulatory Commission issued its fourth Comprehensive Tariff Order on Wind Energy - **30th March, 2016**
- Maharashtra published RPO regulations covering the period Financial year 2016-17 to Financial year 2019-20.
- MERC (Maharashtra Electricity Regulatory Commission) has come up with the new distribution open access regulation 2016 - **30th March 2016**
- Tamil Nadu Electricity Regulatory Commission issues new amendment in the Renewable Purchase Obligation, 2010 – **March 2016**

Disclaimer

1. The information contained herein has been compiled and collated from grassroots MI sources but its accuracy and completeness are not warranted, nor are the opinions or analysis which are based upon it
2. However, the data is fairly accurate and is based on extensive reconciliation with relevant industry stakeholders
3. The statistical data if presented or published by the relevant government agencies in due course of time, shall prevail in all eventualities
4. The compilation makes minimal references to the names of OEMs and attempts to portray the generic industry scenario
5. This compilation has been compiled in the personal capacity and shall not be construed as the views of the company/organization employing the author.

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