

EU-India Wind Energy Network (EIWEN)

***Sharing Business & Technological Know-
how***

Round Table Conference

**Business Opportunities in the
Wind Energy Sector in India & Europe**

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PRESENTATION STRUCTURE

- ❖ Characteristics of European & Indian WE markets
- ❖ General WE specific issues that can be addressed by EU-India collaborative effort
- ❖ Specific WT specific issues for a concerted EU-India collaborative effort
- ❖ Potential for EU-India collaborative research
- ❖ Business Opportunities for European/Indian industry



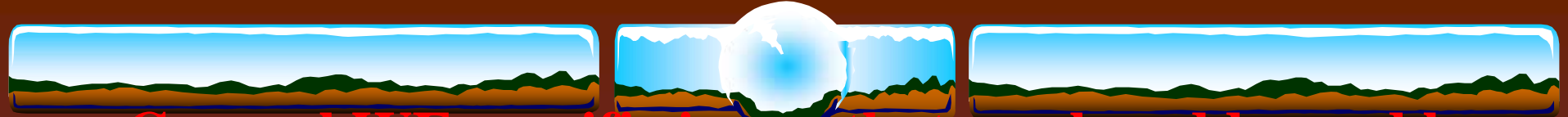
Characteristics of European & Indian WE markets

❖ EUROPEAN MARKETS

- ❖ Large accumulated knowledge, skills & expertise in design, manufacturing, evaluation, testing & standardization
- ❖ Future
 - ❖ Largely Offshore within Europe
 - ❖ Global manufacturing power house- ~70% global market share
- ❖ Need to diversify production (& markets) bcz of
 - ❖ High labor costs & also competition from America
 - ❖ Need to have production facilities closer to installation places
- ❖ Limited supply pool of technical people

❖ INDIAN MARKET

- ❖ Large land based potential: ~1500 MW additions each year
- ❖ Low accumulated knowledge & skills in design, manufacturing, testing and standardization applied to wind turbines
- ❖ Has a large pool of existing technical (engineering) and analytical skills
 - ❖ Low cost of labor
- ❖ Provides very good opportunities for low-cost quality manufacture



General WE specific issues that can be addressed by EU-India collaborative effort

For improving the performance of wind power plants to make it economically competitive

- ❖ **WEAK GRID &/or HIGHER WIND PENETRATION related issues**
 - ❖ Improved WE forecast methods
 - ❖ True dynamic interaction of WFs & power systems
 - ❖ Transmission network studies on inter-state/transnational level
 - ❖ Uniform methods for national system studies on balancing (reserve capacities & balancing costs)
 - ❖ Solutions to increase power system flexibility
- ❖ **WIND RESOURCE ASSESSMENT**
 - ❖ Better understanding of wind behavior & its intermittency
 - ❖ Use of acoustic sound (SODAR) or Light (LIDAR) and/or satellite observations to improve measurement efforts in offshore & complex terrains
- ❖ **FOR LARGE-SCALE WIND POWER PLANTS**
 - ❖ Use of available communication technologies like (GSM, GPRS, etc.) for continuous analysis
 - ❖ To enable WF operators to specify power available hours in advance to TSOs
 - ❖ And also for better O&M planning to reduce down time etc.



Specific WT specific issues for a concerted EU-India collaborative effort

for achieving new turbine designs capable for competing in restructured electricity markets
(focus on low-cost of generation & high reliability)

❖ ROTORS:

- ❖ Most rotor blades...glass-fiber-reinforced plastics (GRP)

- ❖ As rotor size inc.....trend towards high strength, low weight, fatigue resistant materials involving steel, GRP, Carbon reinforced plastics (CFRP), and others

❖ GEARBOXES

- ❖ Integrated compact low weight gearboxes

- ❖ Greater understanding to be incorporated in future Gearboxes on account of dynamic loads

❖ GENERATORS

- ❖ Variable speed, permanent magnet with high power solid-state electronics

❖ TOWERS

- ❖ Low cost material...as it comprises ~65% of WT wt.

- ❖ Pre-stressed concrete etc.

❖ WT control

- ❖ New innovative concepts to reduce loading and/or fatigue on various WT components



Potential for EU-India collaborative research

to equip Indian & European industry adequately...to enable due response to evolving needs of global market by building better understanding of involved

- ❖ Fundamental engineering,
- ❖ Scientific understanding, and
- ❖ Associated design capabilities

❖ **Co-operative Research & Testing program involving**

- ❖ Industry support (Manufacturing and Design in Aerodynamics, aero-elastic, meteorology, materials etc.)
- ❖ Utility analysis (Power systems studies etc.)
- ❖ Support & development of certification & standards (CWET & BIS to work with major EU laboratories/certification bodies and participate in numerous standards committees and get MEASNET accreditation to CWET & a no. of pvt. Players) w.r.t
 - ❖ Wind turbine
 - ❖ Wind resource assessment
 - ❖ Wind power project

❖ **Turbine Research program to**

- ❖ Develop in collaboration competitive, high performance & reliable WT's
- ❖ Research on components & systems for next generation large WT's & also small WT's for wide range of commercial applications

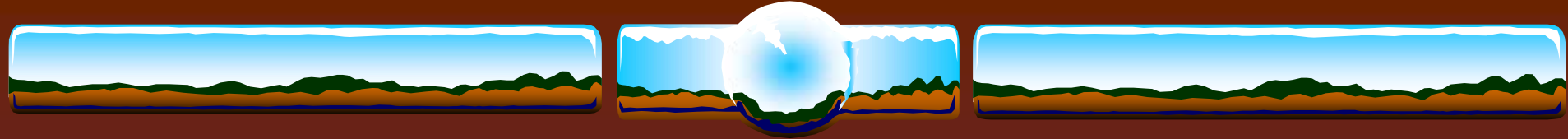
❖ **Applied research program to**

- ❖ Better understanding of wind forecasting and grid integrational issues
- ❖ Better understanding of unsteady aerodynamics to reduce structural loads & resulting fatigue
- ❖ Essentially, in areas of
 - ❖ Aerodynamics & Aero elasticity
 - ❖ Structural & material designs of rotors/blades
 - ❖ Improved WT control concepts
 - ❖ Improved monitoring & measuring techniques



Business Opportunities for European/Indian industry

Category	Components/services	Potential European or Indian firms
Manufacturers	<ol style="list-style-type: none"> 1. Generators (Induction/ Synchronous) 2. Blades 3. Towers (Steel/Concrete) 4. Raw material for Blades (FRP, Resins, Foam & Paints) 5. Gearboxes 6. WT Controller 7. Bearings 	<ol style="list-style-type: none"> 1) Europe (ABB, ELIN, Siemens, etc) / India (Jyoti, Kirloskar, Crompton Greaves, L&T, etc) 2) Europe (Euros, Abeking & Rasmussen Rotec GmbH etc) 3) India (L&T, etc.) 4) Europe(Devold, BTI, Saertex, Saint Gobain, Shell, BASF, etc.) 5) Europe (Hansen, Winergy, Bonfiglioli Getriebe, Brevini Riduttori etc.)/ India (Elecon, Shanti Gears, etc.) 6) Europe (Mita-Teknik, DANcontrol, etc.) 7) Europe (IMO, SKF, Bosch Rexroth, etc)
Consultancy firms (Design & Technical)	<ol style="list-style-type: none"> 1) Grid integration issues of WT operation in weak Indian grids 2) Wind forecasting & wind derivative/insurance 3) Gearbox 4) Generators (Induction/Synchronous) 5) Low cost (low weight) towers 6) Controller for optimized op. in Indian grids 7) Blades 	<ol style="list-style-type: none"> 1) Europe (GH, ECN, Risoe, etc)/ India (ERDC, CWET, etc), 2) Europe (GH, Risoe, etc.)/ India(CWET, IITs, Indian Meteorological Department, etc) 5) Europe (Aerodyne, MECAL etc.)/ India (TCE, etc.) 6) Europe (ECN, GH, etc.)/ India (ERDC, etc.) 7) Aerodyne, MECAL, GH, NGUp Rotor Blades,
Research Institutions & universities	<p>Design of better aerodynamic blades for low wind class that which have reduced drop in efficiency even when blades get dirty (as in tropical cond. with high humidity)</p> <p>Integrated aero-elastic design load concepts for low wt. WTs</p>	<p>Europe (Technical Univ of Delft, Univ of Copenhagen, etc.)/ India (IIT Madras, IIT Kanpur, IISc etc)</p>



Thank You !