

LONG TERM R&D NEEDS: SPANISH CASE.

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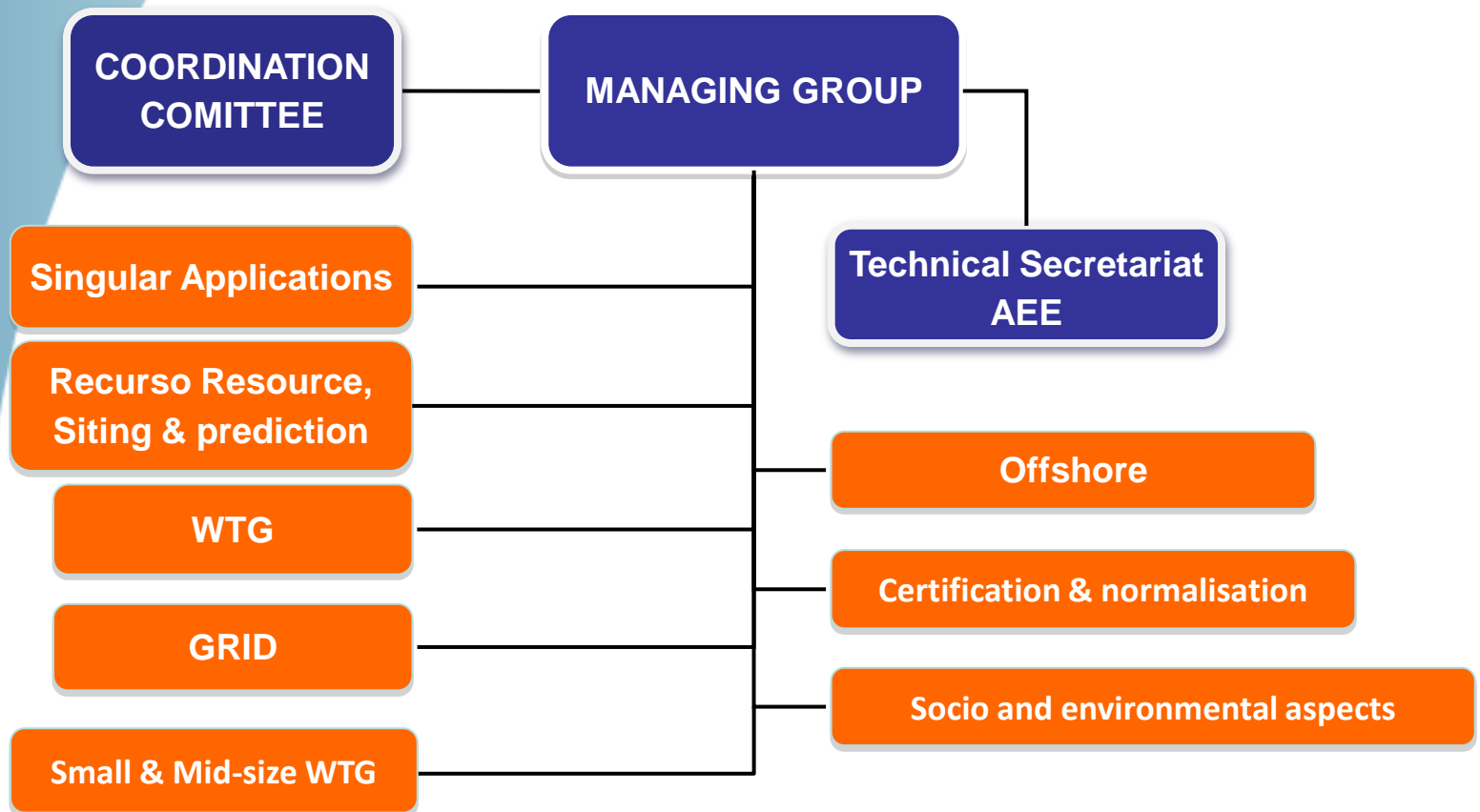
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WHAT IS REOLTEC?

- **REOLTEC** is the Spanish Wind Energy Technology Platform, created with financial support of the Spanish Ministry of Science and innovation (MICINN), since 2005.
- Main target: defining the R&D priorities of the sector.
- It is organized through a Managing Group and several Working Groups.

WORKING GROUPS



PARTICIPANTS

MIEMBROS REOLTEC

Acciona Energía	Gamesa Corporación Tecnológica, S.A.
Acciona Eólica CESA, S.L.	Gamesa Energía
ACM, S.L.	Gamesa Energías Renovables
AENOR	Gamesa Eólica
ALATEC	Garrad Hassan & Partners Ltd
Alstom Power Energy	GE ENERGY
Asociación Empresarial Eólica	Grupo INGETEAM
Barlovento Recursos Naturales	I+F Consulting
BESEL, S.A.	IBERDROLA, S.A.
BIDSA	Iberdrola Energías Renovables
BORNAY AEROGENERADORES, S.L.	Iberdrola Ingeniería y Construcción, S.A.U
CADE Soluciones de Ingeniería, S.L.	IDAE
Capital Energy	IDESA Ingeniería y Diseño Europeo, S.A.
Casandra/W2M	IIC Instituto de Ingeniería del Conocimiento UAM
CDTI	IIT Universidad Pontificia de Comillas
CENER	Ikerlan Technological Research Center
CIDAUT	ISOTROL
CIEMAT	Kin Tech Ingeniería
Cluster de Energía del País Vasco	M. Torres
Construcciones y Obras Llorente, S.A.	MADE
Corporación Eólica CESA	MATZ-ERREKA S.COOP

MIEMBROS REOLTEC

E2Q Energy to Quality	METEOSIM, S.L.
Ecotecnia, s.coop.c.l	METEOTEMP
EDP Renovaveis, S.L.	NEO Nuevas Energías de Occidente, S.L.
ENDESA Cogeneración y Renovables, S.A.U.	OCEANA
ENERFIN	Red Electrica de España
ENERGI E 2	RENOMAR, s.a.
Enertron	Sociedad Española de Aplicaciones Ciberneticas, S.A.
EOLICA NAVARRA S.L.	SOLUCIONES ENERGETICAS, S.A.
EREDA, S.L.	Soluziona O & M
Esdras Automática, S.L.	STARLAB, S.L.
EUVE	TAIM-TFG, S.A.
EVERIS Spain, S.L.	Tudor - Exide Technologies
EYRA, S.A. (Energía y Recursos Ambientales, S.A.)	Universidad Carlos III Madrid
Fundación CARTIF	Universidad de Educación a Distancia
Fundación CIRCE	Universidad de la Laguna (ULL)
FUNDACION INASMET-TECNALIA	UPM E.T.S.I. Industriales
Fundación Labein-Tecnalia	Vestas Eólica
Fundación LEIA Centro de Desarrollo Tecnológico	Wind To Power System, S.L.
Fundación Robotiker	WINDECO TECNOLOGIA EOLICA, S.L.
Fundación Tekniker	WINTEST IBÉRICA, S.L.

GENERAL TARGETS

- **Strategic targets:**
 - Reduction of life cycle generation costs (LCOE).
 - Increase of the availability and reliability of the systems.
 - Grid integration – Power quality.

Other targets:

- Improvement of the logistic (transport, installation and **O&M**)
- Security in network operation: LVRT, permanent voltage control, improvement of participation in ancillary services, regulating services.
- Solutions for energy storage & load management.
- Development of reliable local and autonomous applications (small wind power and smart grid concept).

R&D Priorities in Site Assessment

- Wind profile at high levels (>150 m).
- Wind structure in wind farms (complex terrain, turbulence, vertical shear and offshore).
- Offshore wind measurements.
- Forecasting from 15 min to 15 days (all WF in Spain forecasts for the day ahead market).
- New adapted measurements systems (lidar, floating met towers, etc).
- Wind structure in urban areas.

R&D Priorities in WTGs

General priorities:

- Aero-elastic codes development.
- WTG models & simulation algorithms.
- New materials:
 - Weight reduction.
 - Cost improvement.
- Design validation.

R&D Priorities in WTGs

Rotor:

- New profiles (for small and large blades).
- Larger blades (split blades).
- Lighter structural designs.
- New materials (nano-materials).
- Noise control.
- Automated production processes.

R&D Priorities in WTGs

Gearbox

- Condition monitoring & problem characterization.
- Increase of components' life span.
- High torque couplings.
- Dynamic behavior.

Generator

- Transient behavior & shaft alignment.
- High voltage generation.
- New materials and their supply (superconductors, rare earth...).

R&D Priorities in WTGs

Monitoring

- Load monitoring.
- Specialized sensors (blades – rotating parts – electronics).
- Signal analysis methods – Condition Monitoring Strategies (aeronautical references).
- WTG fleet supervision & management decision tools.

R&D Priorities in O&M

- Predictive maintenance & condition monitoring:
 - Component sensing
 - State monitoring and breakdown forecast
- Component reliability (studies of rate and type of failures) – BADEX project (shared O&M database).
- Operation with failure tolerance.
- New O&M strategies (share spare part stock).

R&D Priorities in Grid Integration

- Advanced control systems for wind farms
- Monitoring and prediction of voltage dips. Applications of voltage control systems.
- Studies of the impact and operation of a system with high wind penetration.
- Improvement of the use of the energy production forecasting for system operation.
- Specific analysis of electric systems in islands.
- Load management strategies: electric vehicles, demand side, ...

R&D Priorities in Offshore Wind Farms

- Offshore wind resource assessment
- Wave models.
- Floating foundations and new support structures.
- Environmental & social impact studies.
- Wind Turbine Protection (bio-fouling, corrosion...)
- Electrical substations
- Offshore Wind Farms Logistic
- Test and Demonstration Plants (Zéfir project)

R&D Priorities in Certification and Standardization

- Development of test and verification standards applied to :
 - Wind farm design.
 - Wind farm security
 - Production capacity of wind farms.
 - Wind farm availability.
- Electromagnetic compatibility of wind farms:
 - Voltage control – Frequency control.
 - Development of norms for sub-systems that increase modularity accelerating market development.
- Mid-size wind power standards (100 – 300 kW).

R&D Priorities in Singular Applications

- Development of short term energy storage systems:
 - Supercapacitors.
 - Flywheels.
 - Batteries.
 - Compressed Air
- Development of isolated solutions.
- Small WTs for autonomous systems.

Sociological R&D Priorities

- Evaluation of the macroeconomic impact of wind farms.
- Optimization of socioeconomic returns.
- Analysis of the social response and degree of acceptability.

R&D Priorities in Environment

- Recyclability of components: Blades
- Visual impact
- Impact on birds and sea fauna
- Noise reduction
- Study on the impact on radiofrequency and its limitation
- Impact of WF on aviation radar

CONCLUSIONS

- Priorities similar to other technology platforms but adapted to the specificity of the Spanish market:
 - Grid integration.
 - Complex terrain & highly turbulent wind regimes.
- Important to reinforce the cooperation between technical centers.
- Response of Cies & technical centers to calls, mainly oriented to:
 - Grid integration.
 - Offshore (floating).
- Looking for best alignment possible with SET-Plan.

THANK YOU FOR YOUR ATTENTION

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