



# 5<sup>th</sup> Wind Energy Systems Engineering Workshop

## Final Conference CL-Windcon Project\*

October 2nd – 4th, 2019  
Pamplona (Spain)

Hosted by National Renewable Energy Centre of Spain (CENER),  
NREL and DTU Wind

### Wednesday 2<sup>nd</sup> October, 2019

08:15-09:00 Registration and welcome

09:00-10:00 **Opening & Introduction**

Institutional Opening

CL-Windcon Project

Mikel Iribas (CENER)

10:00-10:45 **KEYNOTE: Spanish experience. Renewable energy integration in Ancillary Services**

**Marta Pérez García (REE)**

10:45-11:05

11:05-12:15 **SESSION 1- Wind Power Plants in the 21st Century Electricity system**  
**Chairperson: Garrett Barter (NREL)**

LCOE: update of recent trends (general and offshore)

Tifenn Brandily (BNEF)

LCOE Alternatives: System Value and Other Profitability Metrics (capacity value, time varying revenue, etc.)

Philipp Beiter (NREL)

Variance Reduction in Wind Farm Layout Optimization

Andrew PJ Stanley (Brigham Young University)

12:15-13:15 Lunch



\*This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 727477



13:15-14:25	<b>SESSION 2- What is Wind Energy Systems Engineering?</b> <b>Chairpersons: Carlo Bottasso (TUM) and Alessandro Croce (POLIMI)</b>	
	Origins of Systems Engineering and MDAO for wind energy applications (wind turbine design)	Carlo Bottasso (TUM)
	Expansion of Systems Engineering in wind energy to plant design applications	Ewan Machefaux (Vestas Wind Systems A/S)
	Re-thinking plant operation and control - maximizing profitability over the plant lifetime	Christopher Bay (NREL)
14:25-15:55	<b>SESSION 3-Application of Wind Energy Systems Engineering in Practice</b> <b>Chairperson: Irene Eguinoa (CENER)</b>	
	Vortex induced vibrations in high soft steel tubular towers	Javier Alonso (SGRE)
	XXL Wind Turbine Challenges	Arantxa Esparza (NabraWind)
	Breaking the ice for the MDAO ship	Sebastian Sanchez Perez-Moreno (Innogy)
	Hybrid Storage Systems in Renewable Energy Integration: Barasoain case study	Eugenio Guelbenzu (Acciona Energy)
15:55-16:15		
16:15-17:45	<b>SESSION 4-Advanced Methods in Wind Energy Systems Engineering - Plant Controls (CL-Windcon)</b> <b>Chairperson: Jan-Willem van Wingerden (TU-Delft)</b>	
	Wind farm controller design and testing using LongSim	Ervin Bossanyi (DNV-GL)
	Dealing with time-varying inflow conditions in wind farm control	Bart Doekemeijer (TU Delft)
	Overview of recent experiments in wind farm control using scaled models in a boundary layer wind tunnel	Carlo Bottasso (TUM)
	Full scale testing of open-loop wind farm control approaches for reducing wake losses	Stefan Kern (GE)





08:30-09:15	<b>Keynote: W2Power: Twin-rotor floating wind platform development</b>	<b>Pedro Mayorga (EnerOcean)</b>
09:15-10:25	<b>SESSION 5-Advanced Methods in Wind Energy Systems Engineering - Design &amp; Optimization</b> <b>Chairpersons: Frederick Zahle and Michael McWilliam (DTU)</b>	
	Advanced MDAO for wind power plant design	Katherine Dykes (DTU)
	High-fidelity wind turbine blade design enabled by adjoint techniques	Frederick Zahle (DTU)
	Large-Scale Gradient-Based Optimization for Wind Energy Systems	Andrew Ning (BYU)
10:25-10:45		
10:45-12:15	<b>SESSION 6-Advanced Applications in Offshore Wind Energy Systems Engineering</b> <b>Chairperson: Mario Garcia-Sanz (US DOE ARPA-E)</b>	
	Control Co-Design of Floating Offshore Wind Turbines: the ARPA-E ATLANTIS Program	Mario Garcia-Sanz (US DOE ARPA-E)
	SiL scaled hybrid testing in the design of floating wind turbines	Jose Azcona (CENER)
	ELISA Technology: from numerical modelling to offshore installation	Joaquín Urbano (ESTEYCO)
	Engineering Judgment and Systems Engineering Perspective from Sandia's Floating Offshore VAWT Project	Brandon Ennis (Sandia Labs)
12:15-13:15	Lunch	
13:15-14:45	<b>SESSION 7-Standards and Data for Wind Energy Systems Engineering</b> <b>Chairperson: Katherine Dykes (DTU)</b>	
	Task 37 guidelines for integrated wind energy system modeling	Pietro Bortolotti (NREL)
	Design for TCs and EQs: Experience from Taiwan	Niels Jacob Tarp-Johansen (Ørsted)
	Publishing FAIR data	Pawel Gancarski (CENER)
	Cybersecurity and wind energy	Elyoenai Egozcue (S21sec)
	New wind power plant control in the framework of existing certification schemes	Nikolai Hille (DNV-GL)
15:30	<b>Visits: Barasoain experimental area (hybrid wind storage plant) &amp; CECOER (Renewables Energy Control Center) - ACCIONA</b>	





09:00-10:00 BLADE OASIS/BASFF Ainara Irisarri (CENER)  
Iñaki Nuin (CENER)

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10:00-11:00 WISDEM & FLORIS Pietro Bortolotti (NREL)  
Garret Barter (NREL)  
Christopher Bay (NREL)

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11:00-11:45 Brunch

11:45-12:45 HAWTOpt2/Topfarm Katherine Dykes (DTU)

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12:45-13:45 Cp-Max Luca Sartori (POLIMI)

