4 June 2019

Invitation
to the IEA Wind Task 32+Task 37 Workshop #15 on
Optimizing Wind Turbines with Lidar-Assisted Control using Systems Engineering

Date: 17th and 18th October 2019
Venue: University of Massachusetts Amherst, Amherst, MA, USA
Following the NAWEA/WindTech 2019 Conference
Workshop leaders: *Task 32:* Eric Simley (NREL), *Task 37:* Pietro Bortolotti (NREL)
Organization team: Katherine Dykes (DTU Wind Energy), Holger Fürst (SWE), David Schlipf (WETI), Andy Scholbrock (NREL)

Introduction to the Topic

The goal of IEA Wind Task 32 is to identify and mitigate barriers to the use of wind lidar for wind energy applications including site assessment, power performance testing, loads and control, and measurements in complex flow. Within the topic of loads and control, Task 32 has been active in mitigating barriers to the use of lidar-assisted wind turbine control. The purpose of IEA Wind Task 37 is to coordinate international research activities to analyze wind power plants as holistic systems. Through the development of analysis tools and reference models, Task 37 advances systems engineering methods for reducing the levelized cost of energy of wind energy projects.

Lidar-assisted control (LAC) is effective at reducing structural loads on wind turbines, which has been demonstrated through simulation as well as field testing. However, it is difficult to determine the reduction in cost-of-energy that can be achieved through the use of LAC, especially because of the additional costs associated with integrating lidar hardware into the turbine design. Furthermore, LAC is often analyzed using existing turbine designs. Systems engineering presents an opportunity to directly include the use of LAC during the turbine design process to optimize the levelized cost-of-energy. The aim of this workshop is to combine the experience in lidar-assisted controller design and modeling from Task 32 with the knowledge of systems engineering analysis using reference wind turbine models from Task 37 to show how wind turbines can be optimized with LAC.

Objectives

The primary objective of the workshop is to identify a process for determining the reduction in cost-of-energy made possible by LAC. This objective can be divided into the following steps:

1. To identify models and simulation capabilities that need to be established to include LAC in the wind turbine optimization process
2. To identify reference wind turbine models and controllers that can be used to quantify the benefits of LAC

3. To propose a process for optimizing a reference wind turbine and baseline controller using LAC
4. To discuss opportunities to further collaborate on the proposed wind turbine optimization research

Concept

The workshop is split into six main sessions:

1. Educational Session: Understanding LAC and systems engineering
2. Presentations on the benefits of LAC
3. Discussion of models needed to include LAC in the wind turbine optimization process
4. Presentations on wind turbine optimization using systems engineering
5. Discussion of methods for optimizing wind turbines with LAC
6. Development of a research plan for optimizing wind turbines with LAC

Expected Outcome

The outcome of the workshop will be

- An exchange of experience in wind turbine optimization with systems engineering and LAC
- Initiation of a working group to write a white paper containing a roadmap for including LAC in the optimization of the cost-of-energy of wind turbines
- Identification of opportunities to pursue further research on wind turbine optimization with LAC

Expected Participants

- Wind turbine manufacturers
- Lidar manufacturers
- Consultants
- Researchers
- Academics

Practical Arrangements

Registration

Please register online to participate in the workshop. Instructions on how to register and current information about the workshop can be found at https://www.ieawindtask32.org/workshop-15/.

Please register before **15 September 2019**. Registration for the workshop is free of charge.

Please send **by October 7 one slide per person** (PDF format) with your experience in systems engineering and/or lidar-assisted control and your expectation for the workshop. The slide will be used for the introduction round (see below) and uploaded to our website. Access to the slides and other material from the workshop will be password protected. Examples can be found here or here.

Registered participants will be sent more workshop details prior to the workshop.

Venue Information

The workshop will be held in the Hadley Room on the 10th floor of the Campus Center at the University of Massachusetts Amherst, 1 Campus Center Way, Amherst, MA 01003, USA. The workshop follows the NAWEA/WindTech 2019 conference, which will held from 14th - 16th October,

also at the University of Massachusetts Amherst. More information about the workshop venue, transportation, and lodging, will be available on the NAWEA/WindTech 2019 website.

Contact Information

Please contact Eric Simley (Task 32 workshop leader), Pietro Bortolotti (Task 37 workshop leader), or David Schlipf (IEA Wind Task 32 Co-Operating Agent) with any questions you may have about the workshop.

Program Draft

Day 1: Thursday, October 17th	
9:00	**Registration**
9:30	**Introduction** ● Purpose of the workshop and agenda ● Presentation round – all (please send us your slide, see registration details)
10:30	Coffee Break
11:00	**Educational Session: Lidar-assisted control and systems engineering** ● Overview of lidar-assisted control ● Overview of wind turbine systems engineering
12:15	Lunch
13:15	**Understanding the benefits of lidar-assisted control** ● Invited presentations from the stakeholders with time for questions
14:45	Coffee Break
15:15 - 16:45	**Identifying models needed to include lidar-assisted control in wind turbine design** ● Group discussion in small groups ● Presentation of results to plenary ● Discussion and documentation of results
19:00	Dinner

Day 2: Friday, October 18th	
8:30	**Summary of Day 1**
9:00	**Wind turbine optimization using systems engineering** ● Invited presentations from the stakeholders with time for questions
10:30	Coffee Break
10:45	**Identifying methods for optimizing wind turbines with lidar-assisted control** ● Group discussion in small groups ● Presentation of results to plenary ● Discussion and documentation of results
12:15	Lunch
13:15	**Developing a plan for including lidar-assisted control in wind turbine optimization** ● Discussion of steps that need to be completed to perform wind turbine optimization with lidar-assisted control
14:45 15:15	**Summary of the workshop and follow up** ● Discussion of plan to write a white paper outlining the steps that should be completed to optimize wind turbines with lidar-assisted control ● Decide on next steps