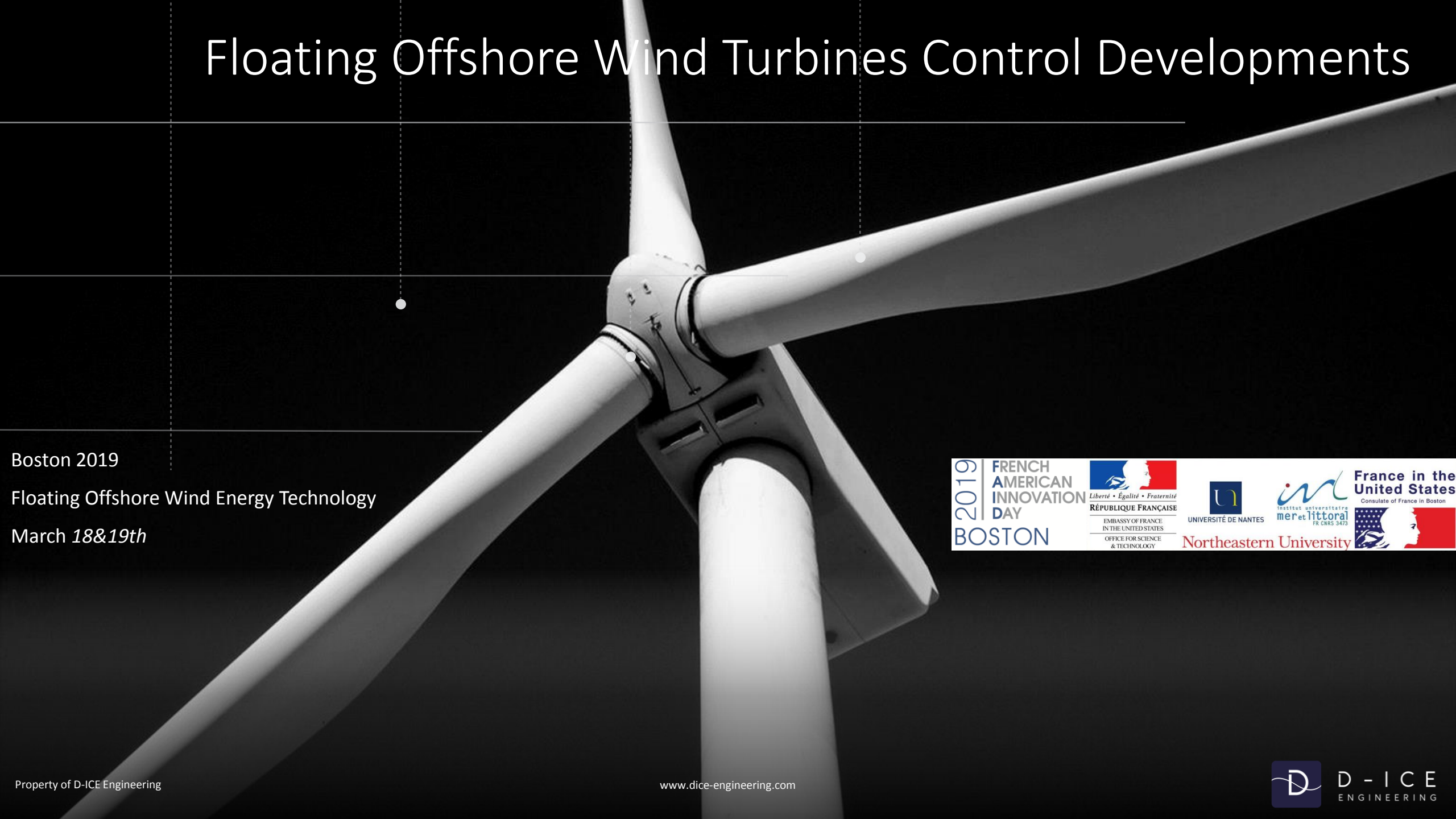
Floating Offshore Wind Turbines Control Developments



Boston 2019

Floating Offshore Wind Energy Technology

March *18&19th*

2019 FRENCH AMERICAN INNOVATION DAY BOSTON

Liberté • Égalité • Fraternité
RÉPUBLIQUE FRANÇAISE
EMBASSY OF FRANCE IN THE UNITED STATES
OFFICE FOR SCIENCE & TECHNOLOGY

UNIVERSITÉ DE NANTES

Institut universitaire mer et littoral FR CNRS 3473

Northeastern University

France in the United States
Consulate of France in Boston

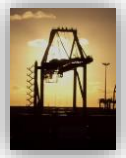
D-ICE ENGINEERING

2019 FRENCH AMERICAN INNOVATION DAY BOSTON

Services & Products

Offshore Engineering

- Hydrodynamics studies
- Design & Simulations
- Metocean analysis & Route Planning
- Basin & Full Scale Tests
- Arctic engineering



Drilling Engineering

- Drilling Control R&D
- Drilling Simulations

Dynamic Positioning

- Design & Simulations
- FMEA & Commissioning
- Complex Operations
- R&D

D - ICE ENGINEERING

Your partner for your innovative projects

Marine Energies

- Offshore Wind
- Control Systems design
- FOWT Life Assessment
- Transport, Installation & Maintenance
- R&D

Ocean intelligent Control Systems

- Route Optimization
- Advanced Monitoring & Aid-Decision
- Autonomous Vessels
- Foil Control Systems

OCEANiCS Wind
Floating Wind Turbine Control Systems

- Advanced Control Strategies
- Farm control
- Compliant with industrial requirements

Deeptech Company founded in 2015

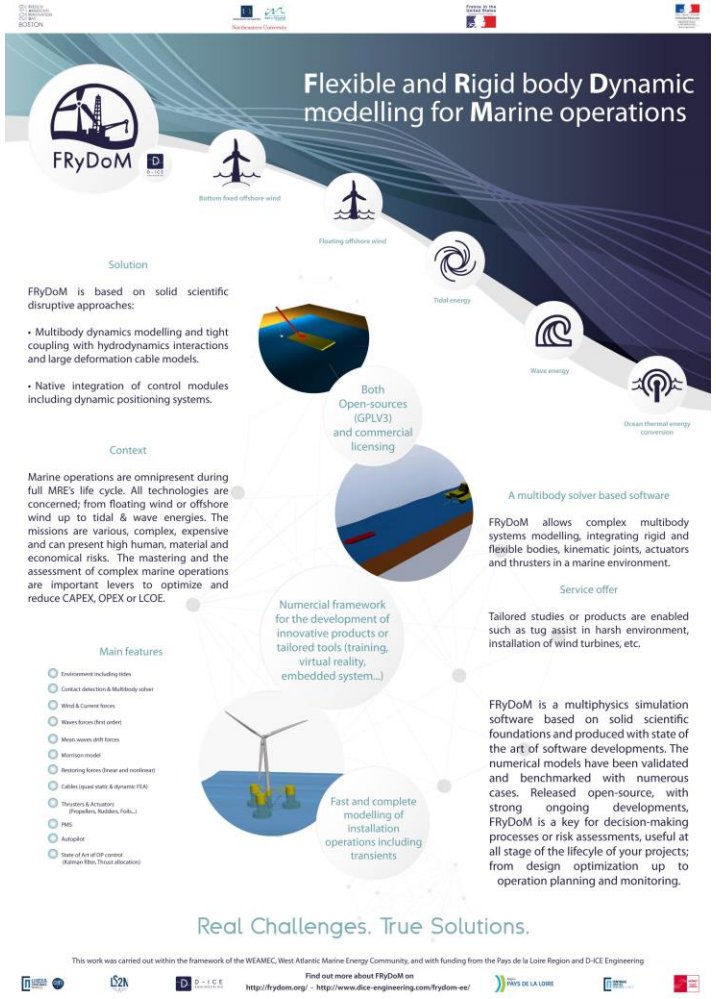
Team: 15 PhDs & MSc

Offices: Nantes & Paris (France)

Proud Member of

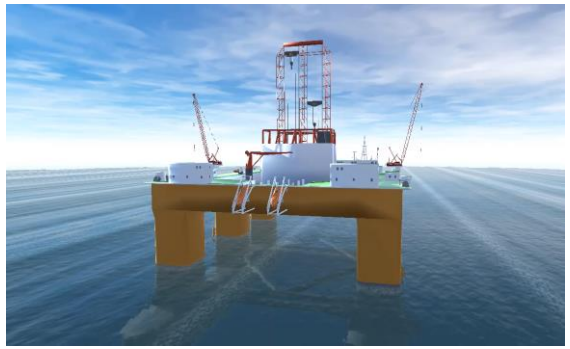
2019 FRENCH AMERICAN INNOVATION DAY BOSTON

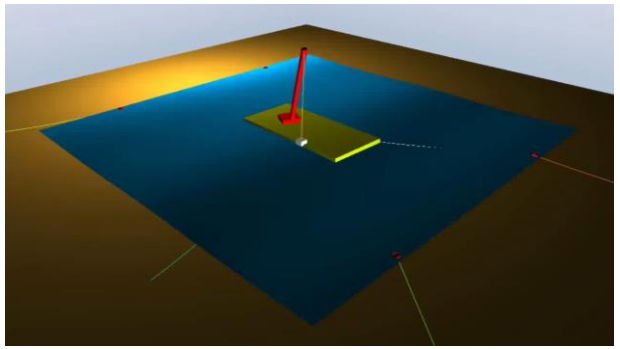
Marine Engineering & Hydrodynamics

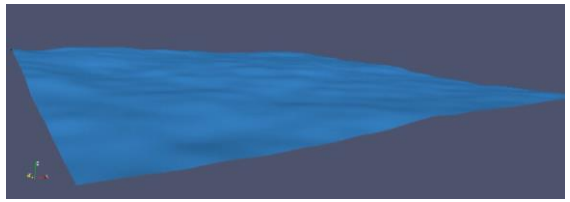


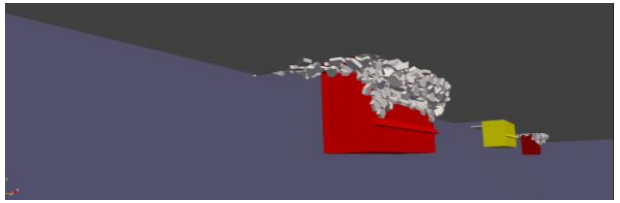
Find out more during Poster Session

- Complex Modelling
- Advanced Hydrodynamics
- Ice Engineering
- Fully Coupled Simulations
- Design of Offshore Operations









Software

FRyDoM

SpiCy

Some of Clients & References

HYDROCEAN
a Bureau Veritas Group Company

SIREHNA
NAVAL GROUP

Multiconsult

TOTAL

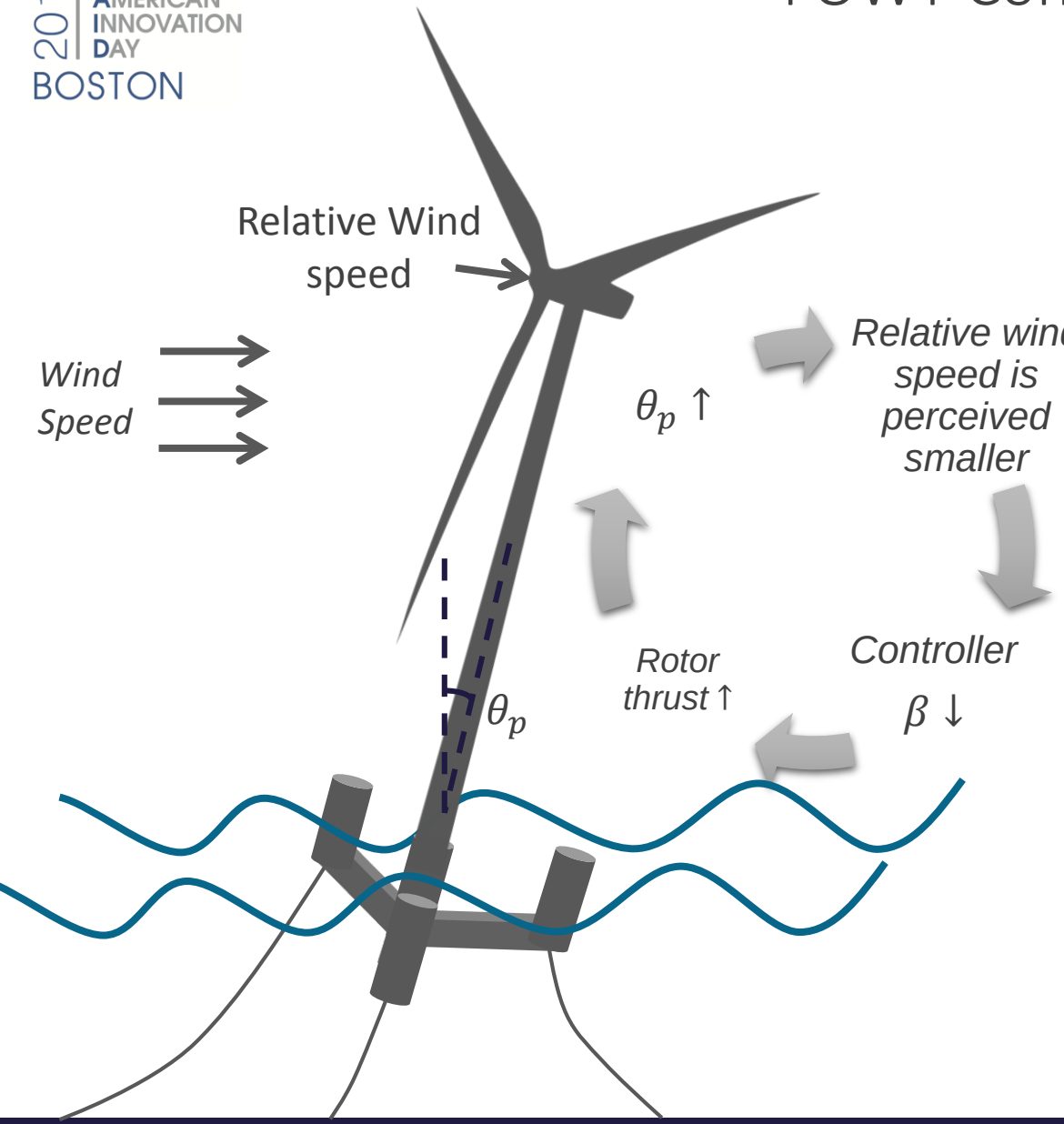
CADDEN
La solution à vos mesures

Néoline

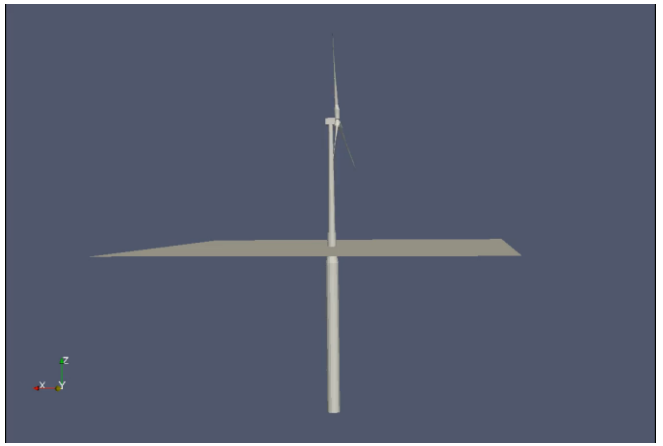
VPLP design

Jelec

FOWT Controller Challenges



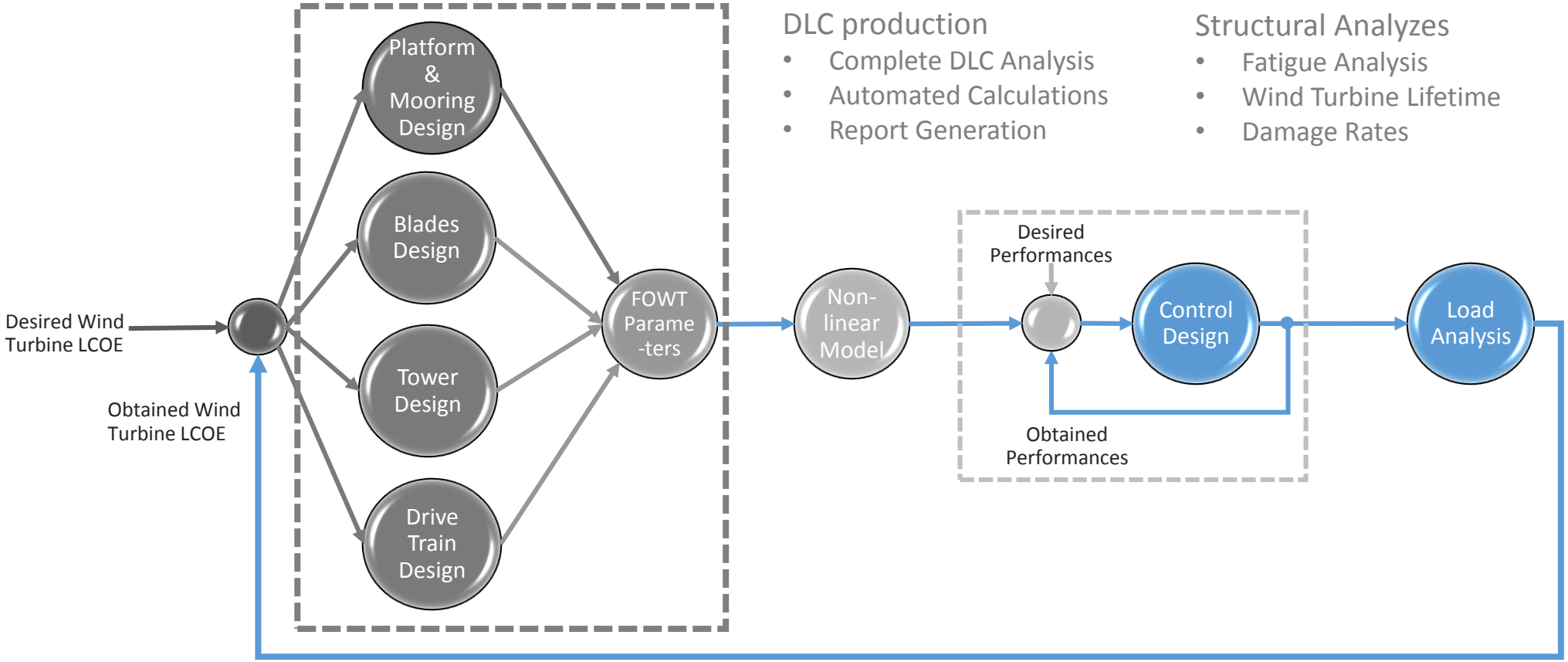
Conventional Control Strategy



Adapted Control Strategy

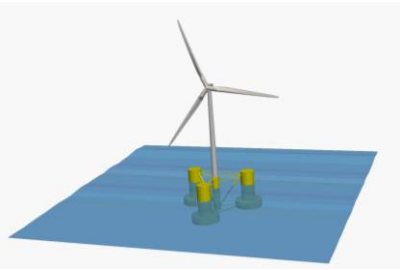
Main known issue:	Tailored and more advanced control strategies can:	Main field of research:
Negative damping • System Instability • Structural Damage	• Decrease oscillations • Decrease fatigue damage	• Model Based Control • Deep Learning Control Strategies • Wind Estimation

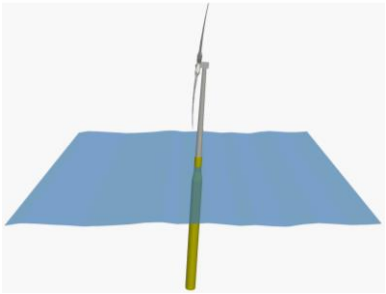
Global Integrated Analyzes Methodology

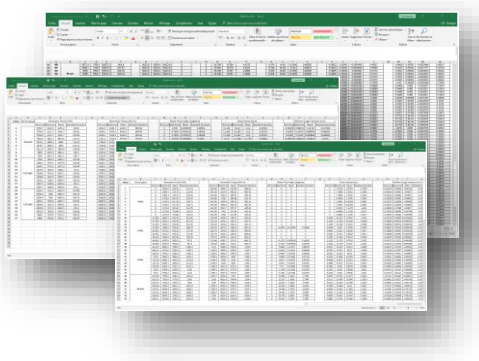


DLC production
- Complete DLC Analysis
- Automated Calculations
- Report Generation

Structural Analyzes
- Fatigue Analysis
- Wind Turbine Lifetime
- Damage Rates







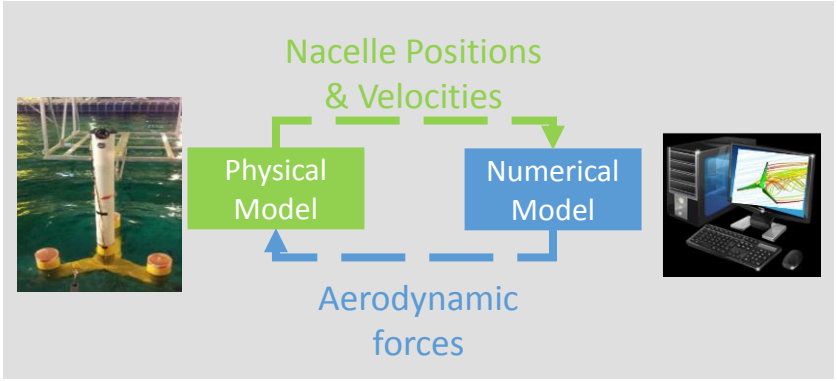
LCOE: Levelized Cost of Energy

Ongoing R&D Projects

SOFTWIND (2018 – 2020)

Software in the loop Testing in Basin

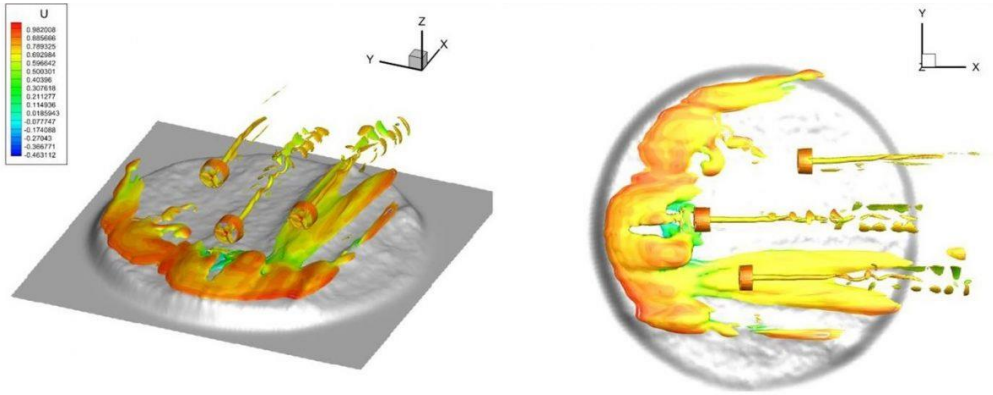
- Basin Test & Aerodynamic Modelling
- Robust & Precise Solution
- Implementation on OCEANiCS-Wind Product



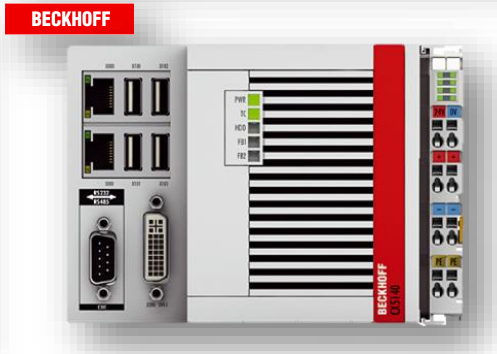
ECOSFARM (2018-2020)

Generic numerical simulation tool

- Bottom-fixed, floating and tidal offshore turbine farms
- Turbine control and farm control validation
- Turbine location optimization



Our Optimal Control Solution for Floating Offshore Wind Turbines



OCEANiCS Wind

Smart & Innovative Solutions

Next Generation Embedded Systems

Proven Hardware Technologies

Remote Assistance & Control

24/7 support