

Future Research

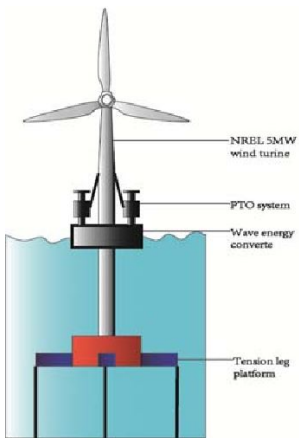
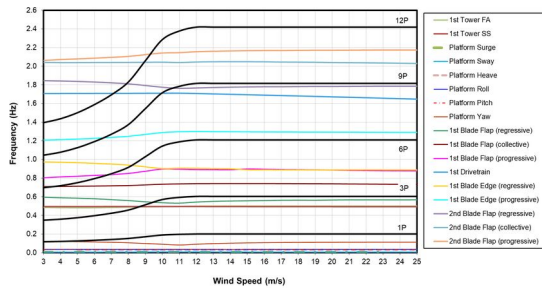
Other foundations like a TLP can be explored.

Region 1 and 3 wind, where OpenFAST focuses on the entire operation mode of the turbine can be combined with this research focusing solely on Region 2.

Special events

- Starting turbine
- Idling turbine
- Blade failure
- Disconnect from grid

Campbell diagram



Project Name	Description	Last Update
OpenFAST	Updated low flow in controller files	7 months ago
ControlMechanics	Update of example	6 months ago
FAST2FAST	Integrate new files in controller files	7 months ago
FAST2FAST2	Integrate new files in controller files	7 months ago
FAST	Small updates for wind input	6 months ago
Plots	Introducing new Campbell subplots	6 months ago
ProgrammeData	Make for V15 make changes from other minor changes	10 months ago
Control	Updates from the controller files	6 months ago
ControlData	Update of test case	7 months ago
Fast	added routine to calculate wind angles from SCF	3 years ago
FASTFAST	FASTFAST	3 years ago
FASTFAST	FASTFAST	6 years ago
FASTFAST	FASTFAST	7 months ago

Susannah Smith is a senior at Pawling High School and a member of the school's Science Research program. She plays Varsity Field Hockey in the fall, Varsity Track in the winter, and dances competitively year-round at SSSPA. After high school, Susannah is going to Cornell University to study architecture and sustainability.

Her scientific interests lie in airborne wind energy (AWE), offshore wind energy, renewable power, and the design process of turbines and energy harvesting machines.

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Investigating the Impact of Region 2 Operation on Spar, Barge, and Semi-sub Offshore Wind Turbine Platforms using OpenFAST

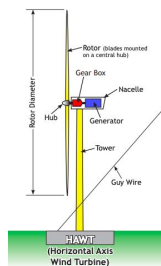


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Background

Renewable Energy

- Increase in Renewable Energy research caused by extensive fossil fuel use
- Solution - Turbines (1)



Wind Turbines-Mechanical energy converted to electricity

Horizontal axis: Blades rotate around axis parallel to ground (1,2)

Onshore (2)

Proven technology
Simple to install
Noise Pollution, eye sores

Offshore (3)

Wind speeds tend to be faster and steadier than on land
Installation difficult and costly
Coastal areas have high energy needs
Out of the way

Current Research

Hypothesis: Out of the spar, barge, and semi-sub foundations, the spar will best be able to withstand region 2 wind in deep water because of weight distribution and shape.

Barge:

- Platform supported by mooring lines
- Large surface area
- Buoyancy Stabilized
- Steel or concrete hull

Spar:

- Cylinder floats vertically in the water
- Ballast tanks in the base of the cylinder volume.
- Ballast tank- Compartment that holds water to provide stability
- Weighted at the base

Semi-sub:

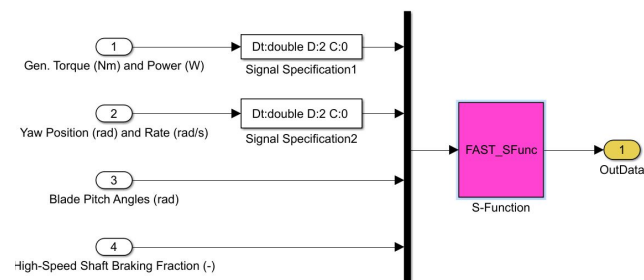
- Partly submerged to provide
- Localization
- Stability
- Avoid large wave loads by utilizing smaller tubulars (columns) in splash zone

Current Methodologies

FAST: Fatigue, Aerodynamics, Structures, and Turbulence (1, 9, 6)
Simulates HAWTs

FAST joins

- Aerodynamics model
- Hydrodynamics models for offshore structures
- Control and electrical system dynamics models
- Structural dynamics models



Two parts of FAST operation Simulation

- Aerodynamic and structural response is determined in time.
- Active controls modified
- Predict loads of HAWT
- Windows executable program file or DLL interfaced with Simulink

Linearization

- Extracting linearized representations of the complete nonlinear aeroelastic wind turbine modeled
- Aid in controls design and analysis