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COST REDUCTION OF
FLOATING WIND TECHNOLOGY

Definition of the IEA 15 MW wind turbine and its use in COREWIND

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Disclaimer:

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Project details:

Duration:
1 Sep 2019 - 28 Feb 2023

Grant agreement:
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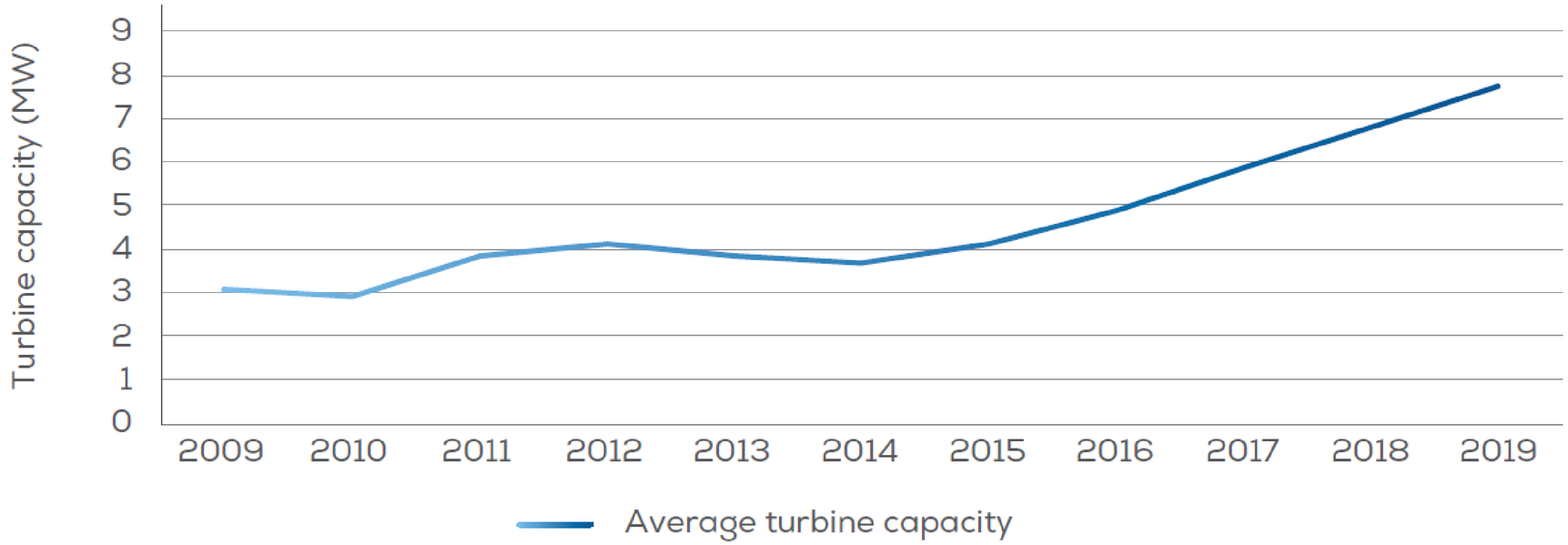
The need for a reference wind turbine

- Turbine size increases



Source: WindEurope

- Public and open reference wind turbines
  - Allow transparent studies
  - Are fully specified and can be freely shared

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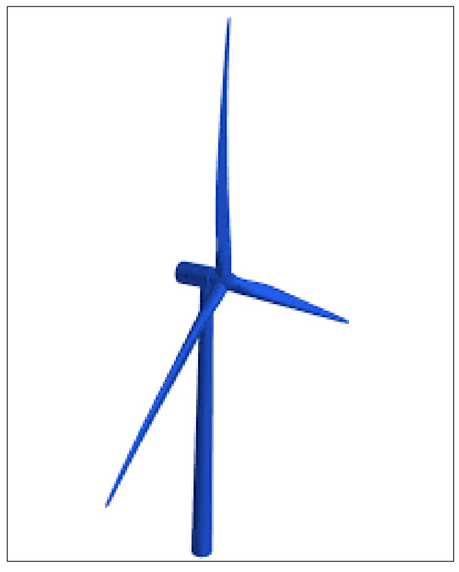
History of reference wind turbines

NREL 5MW
(2009)



DTU 10 MW
(2013)

IEA 15 MW
(2020)

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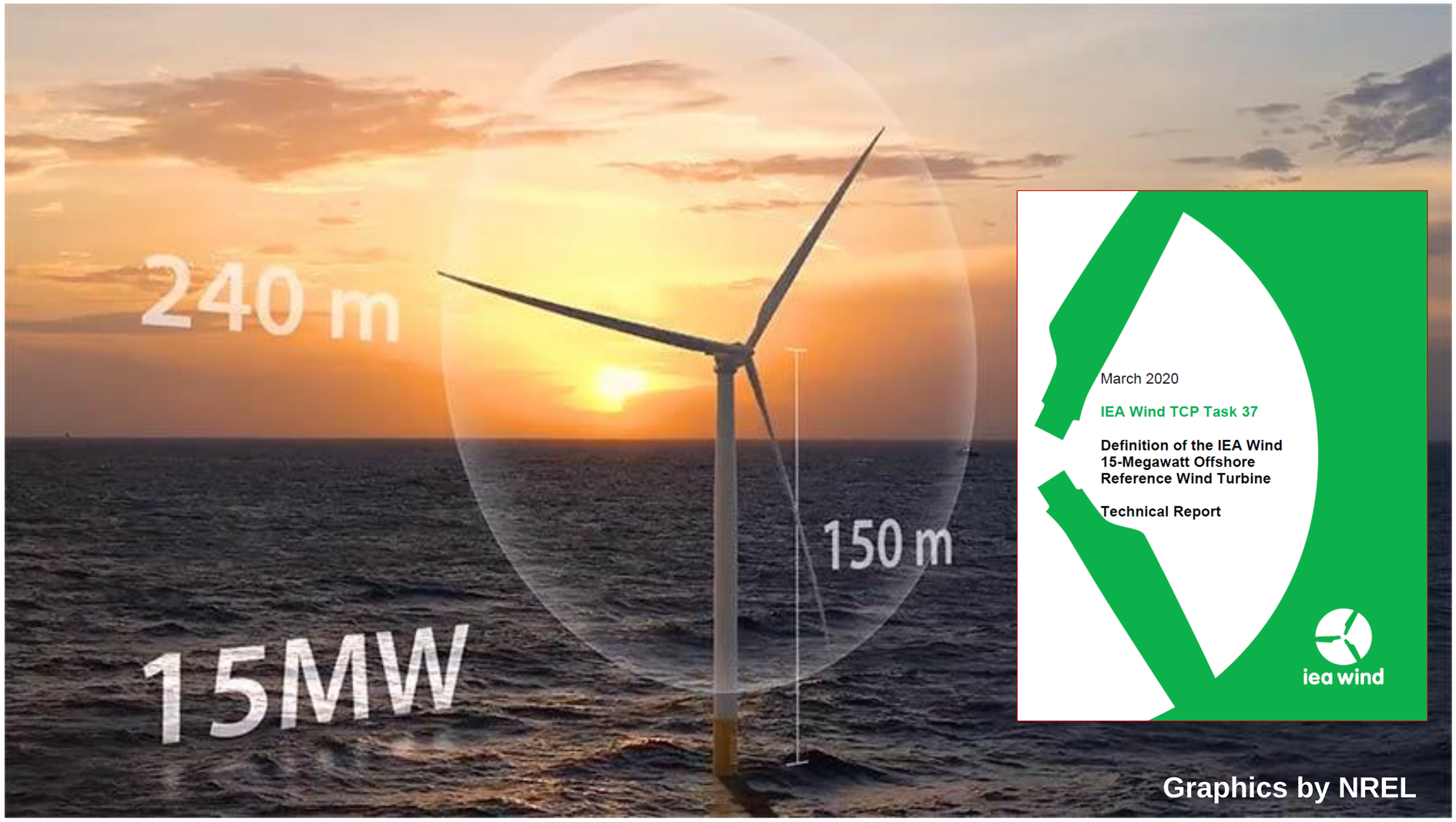
Why a need in COREWIND?

- Load and response driver
- Will make the COREWIND work realistic and relevant

The IEA 15 MW reference wind turbine



Made by NREL and DTU

Is publically available as FAST and HAWC2 models at

https://github.com/IEAWindTask37/IEA-15-240-RWT

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Key specs of the new turbine

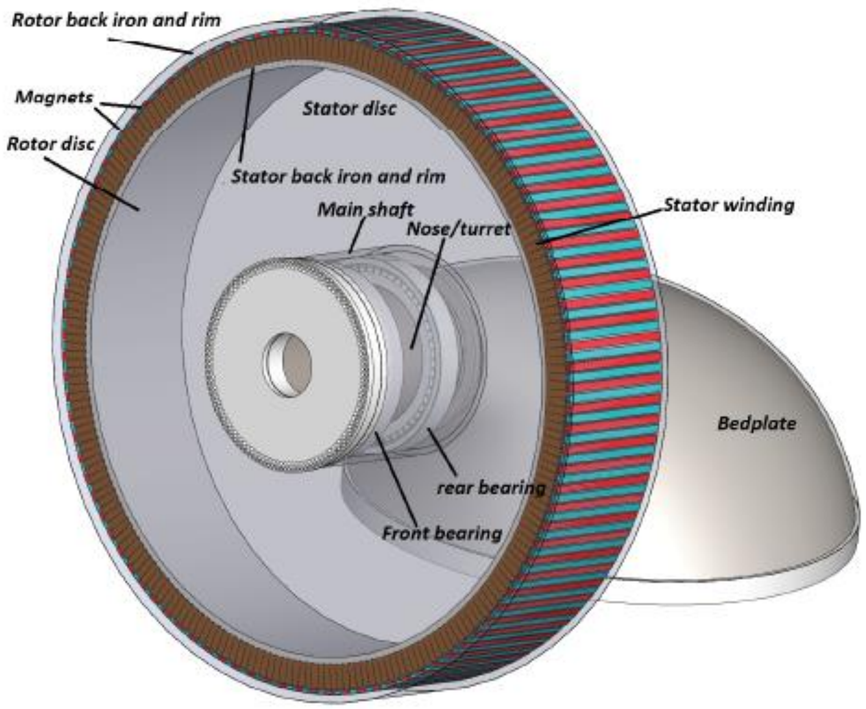
IEC Class IB

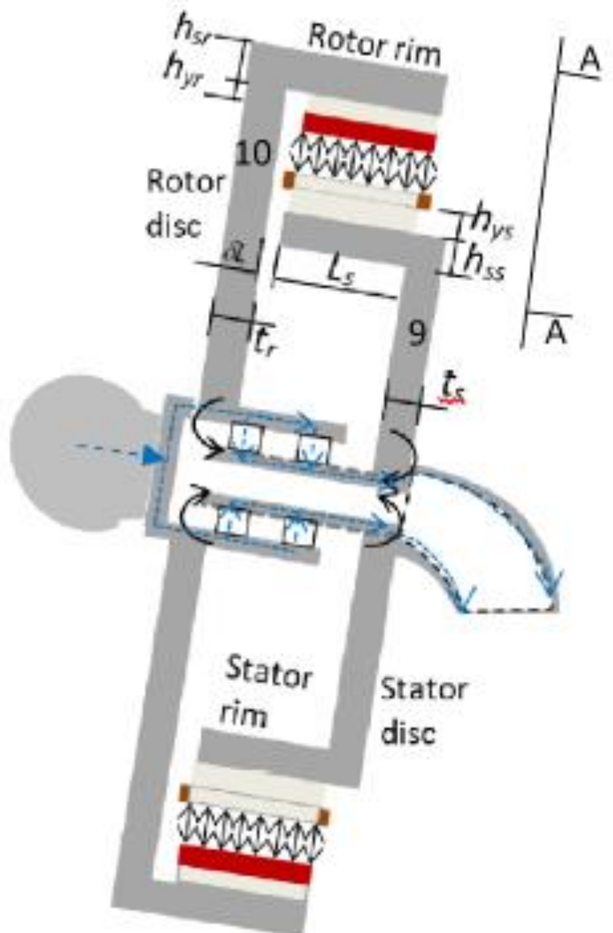
Collective blade pitch control

240m rotor diameter

Direct drive

Rated wind speed of 10.59 m/s





Graphics from the specification report

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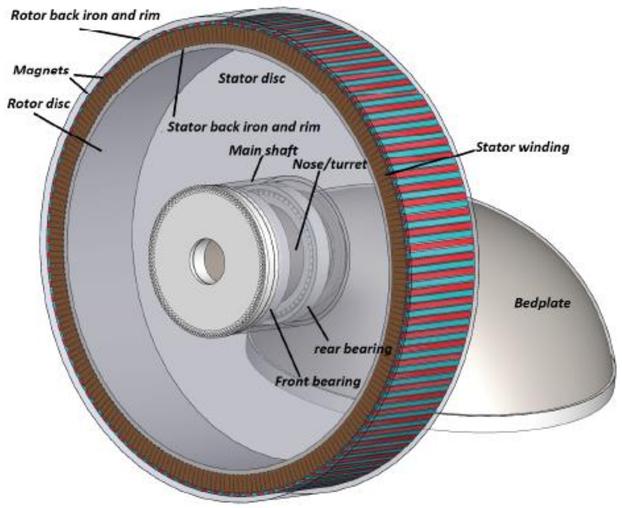
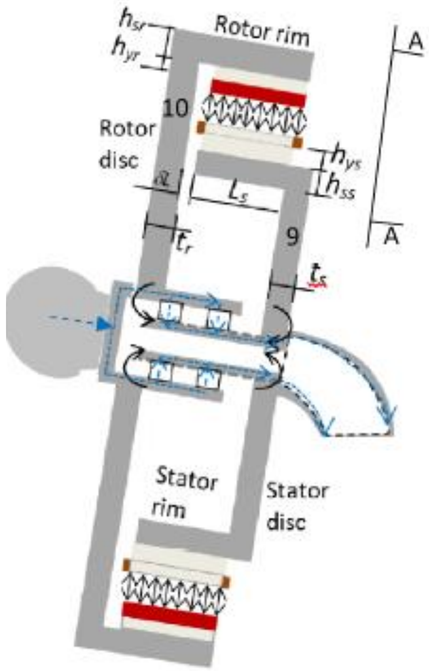
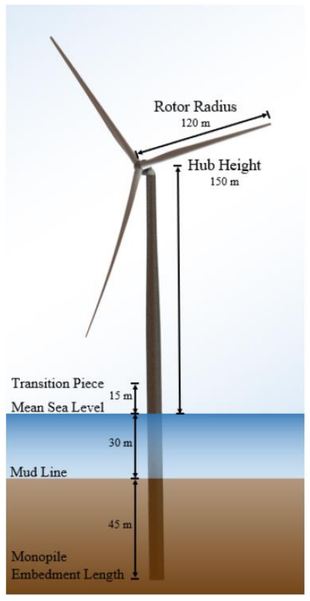
More specs of the new turbine







240m rotor diameter

Direct drive

Parameter	Units	DTU 10-MW Turbine	IEA Wind 15-MW Turbine
Power rating	MW	10	15
Turbine class	-	IEC Class 1B	IEC Class 1B
Specific rating	W/m^2	401	332
Rotor orientation	-	Upwind	Upwind
Number of blades	-	3	3
Control	-	Variable speed	Variable speed
	-	Collective pitch	Collective pitch
Cut-in wind speed	m/s	4	3
Rated wind speed	m/s	11.4	10.59
Cut-out wind speed	m/s	25	25
Rotor diameter	m	178.3	240
Airfoil series	-	FFA-W3	FFA-W3
Hub height	m	119	150
Hub diameter	m	5.6	7.94
Hub overhang	m	7.1	11.35
Drivetrain	-	Medium speed	Low speed
	-	Multiple-stage gearbox	Direct drive
Design tip-speed ratio	-	7 5	9 0
Minimum rotor speed	rpm	6.0	5.0
Maximum rotor speed	rpm	9.6	7.56
Maximum tip speed	m/s	90	95
Gearbox ratio	-	50	—
Shaft tilt angle	deg	5	6
Rotor precone angle	deg	-2.5	-4.0
Blade prebend	m	3.332	4
Blade mass	t	41	65
Rotor nacelle assembly mass	t	674	1,017
Tower mass	t	987	860
Tower base diameter	m	8	10
Transition piece height	m	10	15
Monopile embedment depth	m	42.6	45
Monopile base diameter	m	9	10
Monopile mass	t	2,044	1,318

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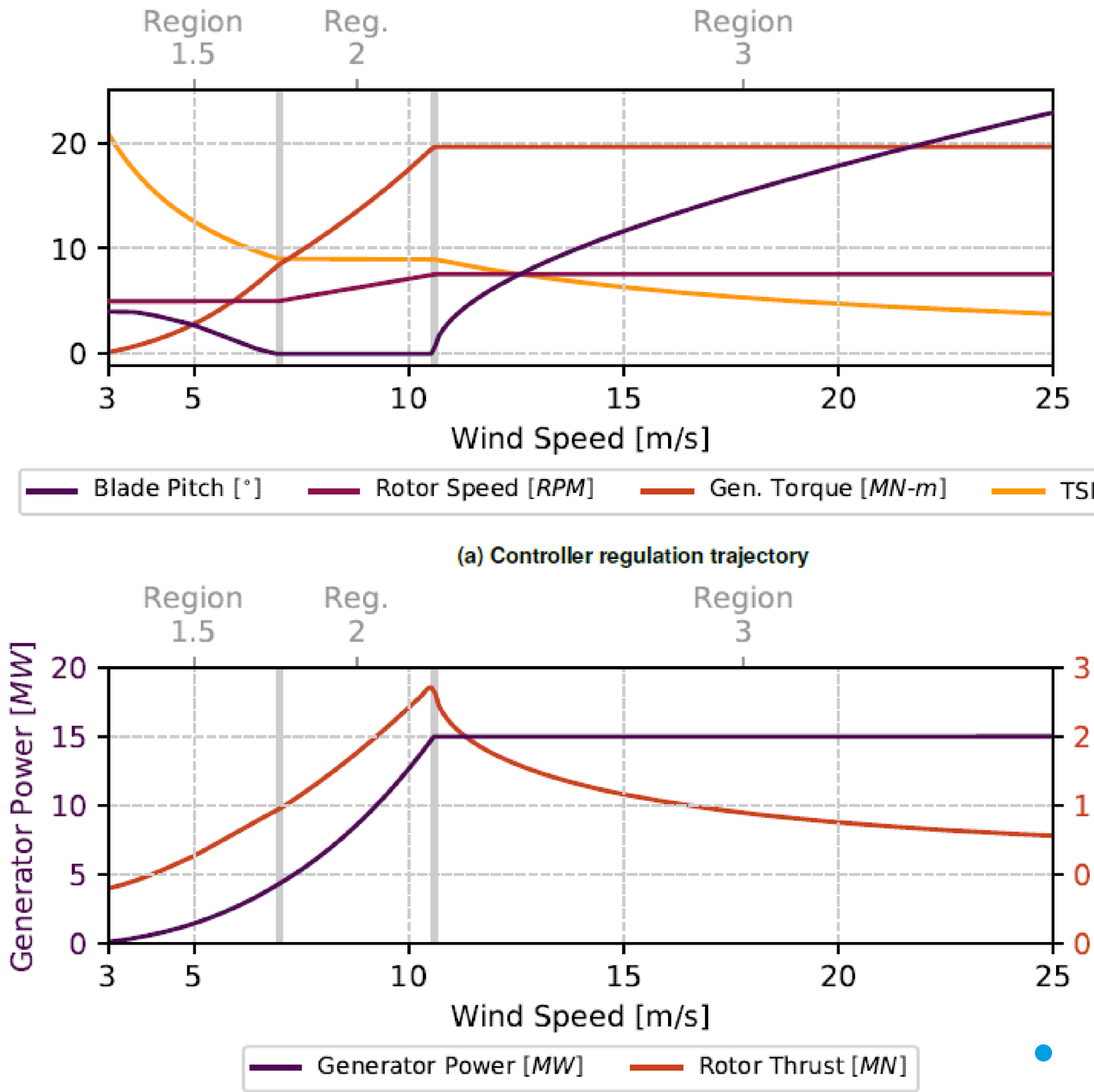
Key performance curves



- Rated thrust is +2500 kN

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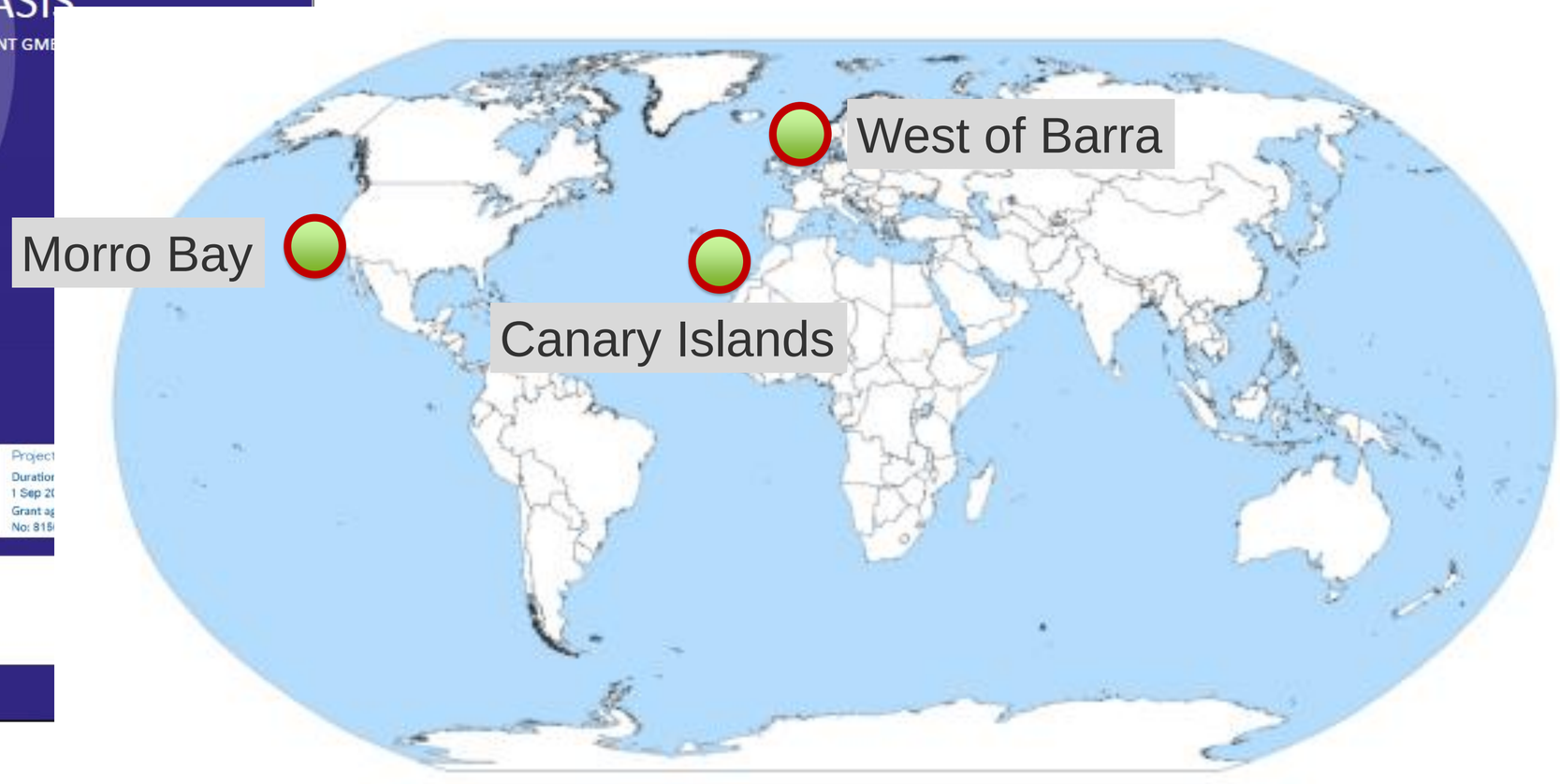
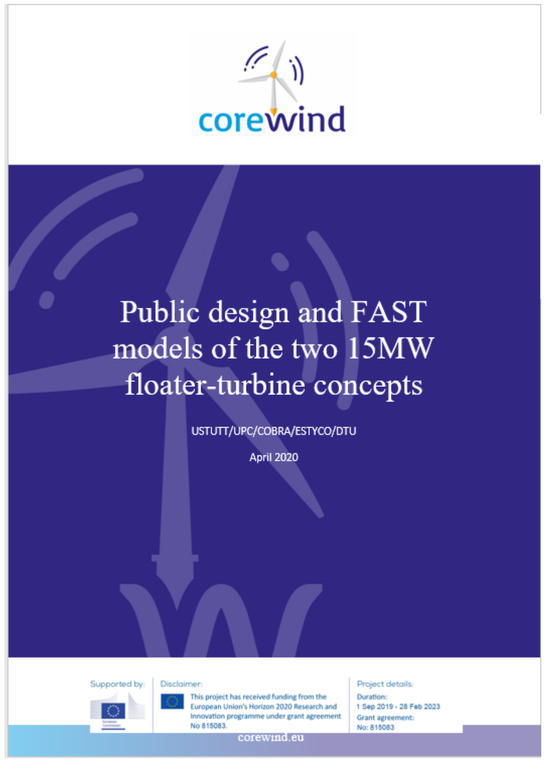
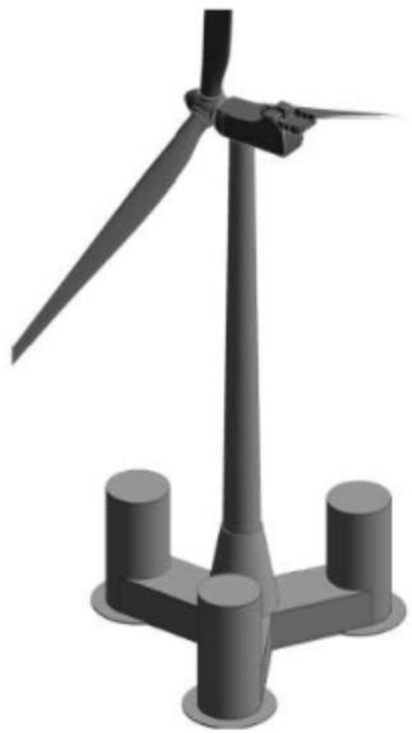
Reference sites in COREWIND

- 3 reference sites
- Wind-wave conditions



15 MW floater upscaling in COREWIND

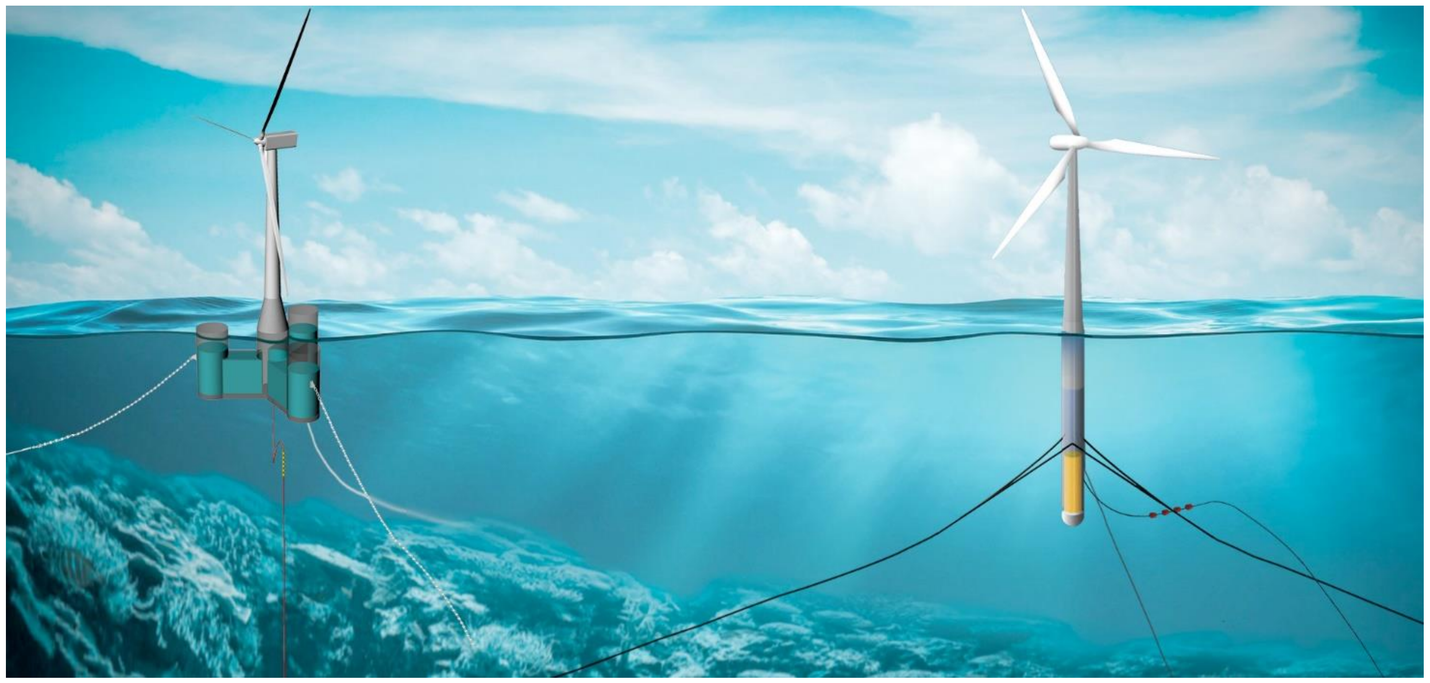




- The ActiveFloat 15 MW semisub floater
  Designed by COBRA and ESTEYCO
- The WindCrete 15 MW spar floater
  Designed by UPC
- Both are made available as publicly open FAST models at
  https://github.com/IEAWindTask37/IEA-15-240-RWT
- Also University of Maine is designing a public semisub in parallel

Next steps in COREWIND

- 15 MW floater-turbine concepts to be used as load and response drivers
- Mooring studies
- Dynamic cable studies
- Physical model tests
- O&M, Life time, LCOE



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