
aerodyn
engineering gmbh
Growing up of the
revolutionary
SCD® nezzy
WIND
POWER
MONTHLY
BEST
INNOVATION
2014

The next generation becomes reality

aerodyn engineering gmbh

- Independent, private owned engineering company
- Turbine design from blade tip to foundation
- Design process from scratch to prototype
- Advanced developments
  - SCD Technology
  - SCDnezzy
  - WindDeSalter

SCD 6.0 MW Rudong, China,
Largest built 2-bladed turbine

The next generation becomes reality

Offshore Experience

- Feasibility study
- Concept design
- Load assessment
- Engineering service
- Tower design
- Blade design
- Certification works
- Project management
- Manufactuting support

Multibrid M5000

Ming Yang SCD 6.0MW

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Features of SCDnezzy

35 m water depth

DNV GL Design Check

Single point mooring

Catenary mooring system

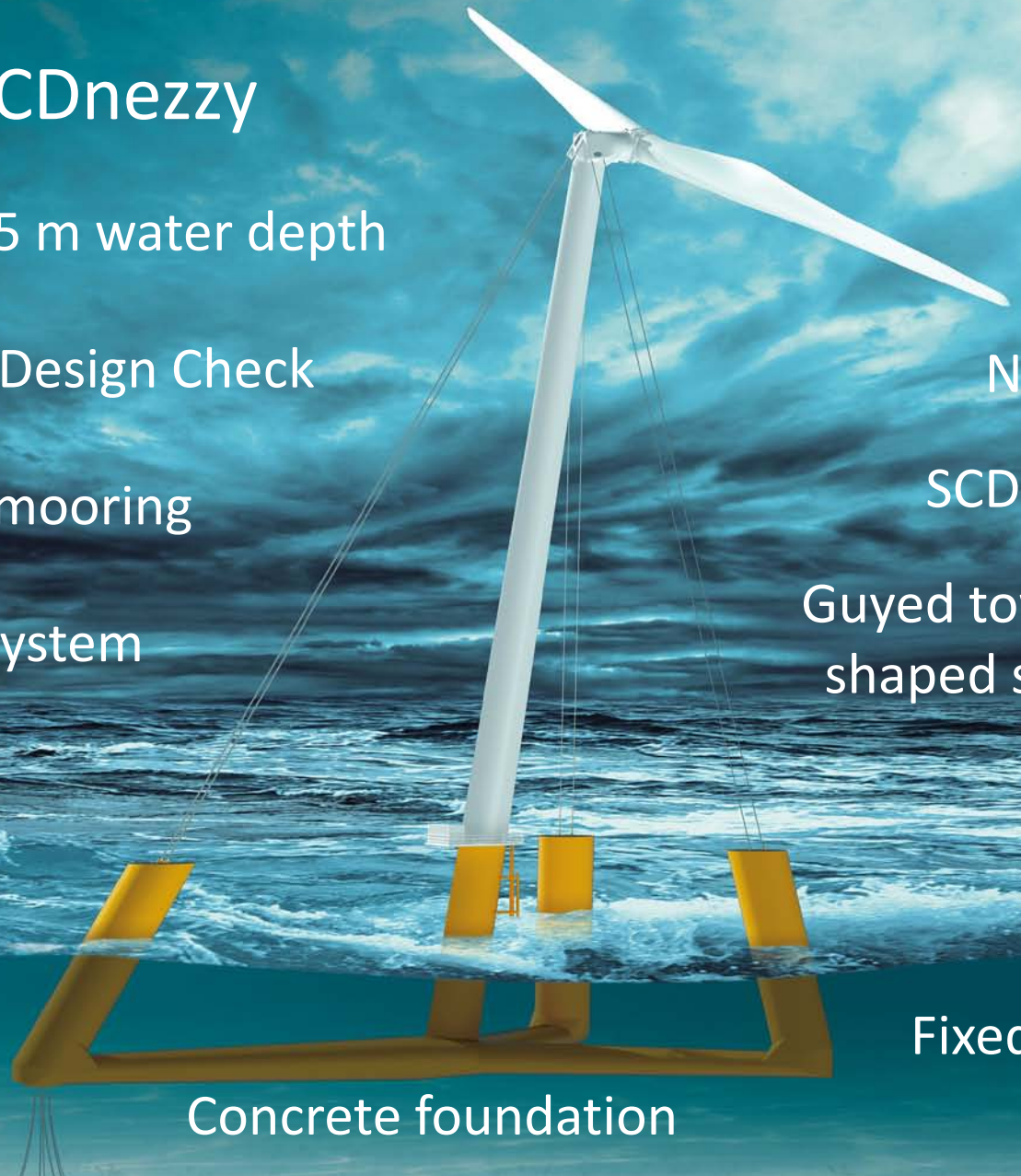
Downwind

Two-bladed

No yaw system

SCD-Technology

Guyed tower with shaped structure



Fixed floaters

Concrete foundation

Why Floating?

- Great offshore wind resource
- Possible for a large range of water depths
- No noise emission problems
- Easy exchange of full turbine in required situations
- No special vessels needed (crane ships, jack-up vessels)
- Full dismantling possible

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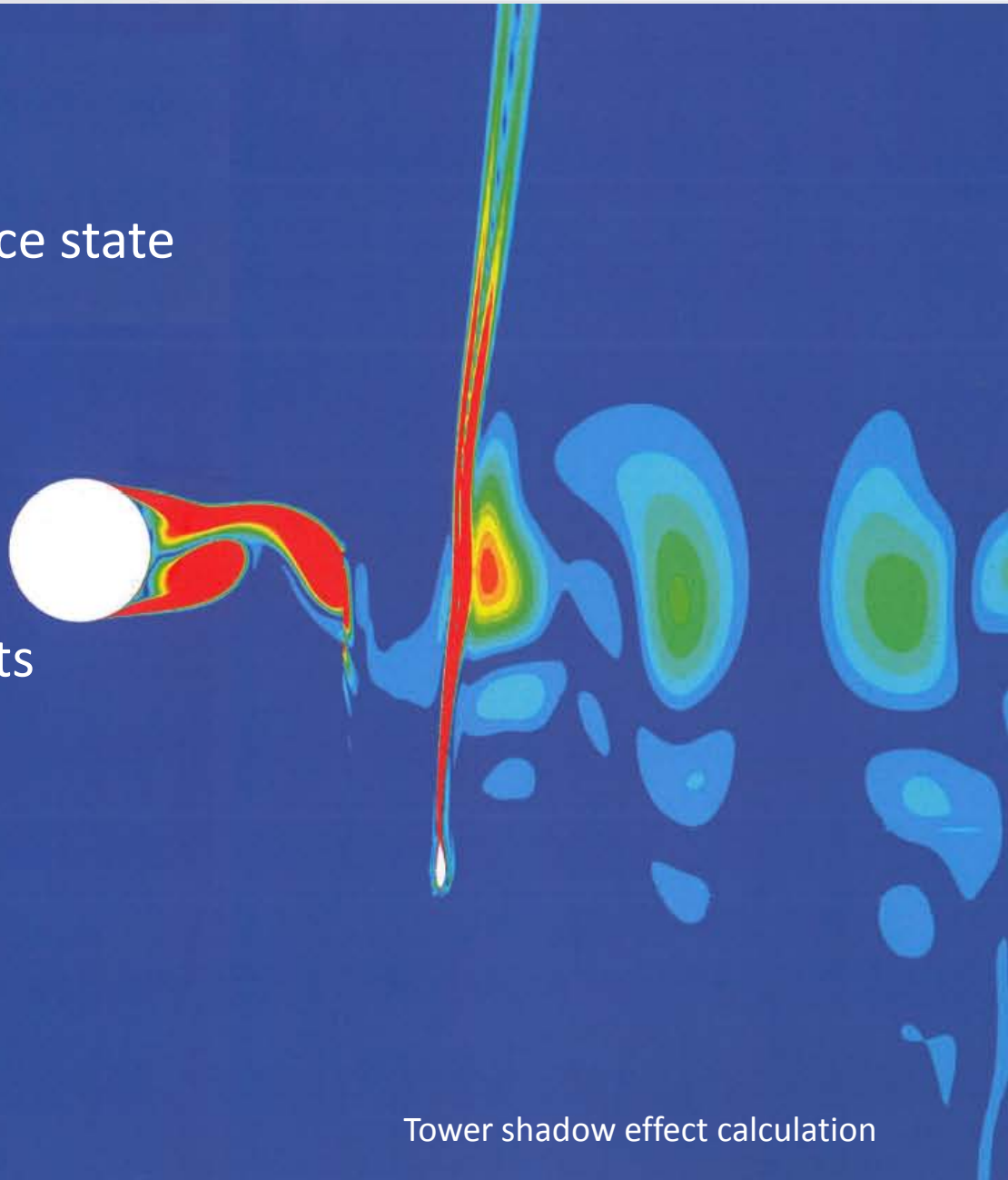
Why 2-bladed?

- Easy turbine installation
- 20 % lighter gearbox mass
- Less tower top mass as a result
- Extended installation time frame
- 75 % rotor mass compared to 3B
- Helicopter landing possible
- Typhoon-proof parking position
- Design and operation experience

Prototype installation SCD 6.0 MW

Why Downwind?

- Natural way of reaching low resistance state
- Wind vane principle
- Blade turns away from tower
- Yaw system acts with gyro forces
- Free yawing possible
- Coning rotor at high thrust
- Self-aligning in typhoon environments
- Manageable in survival conditions
- Design and operation experience

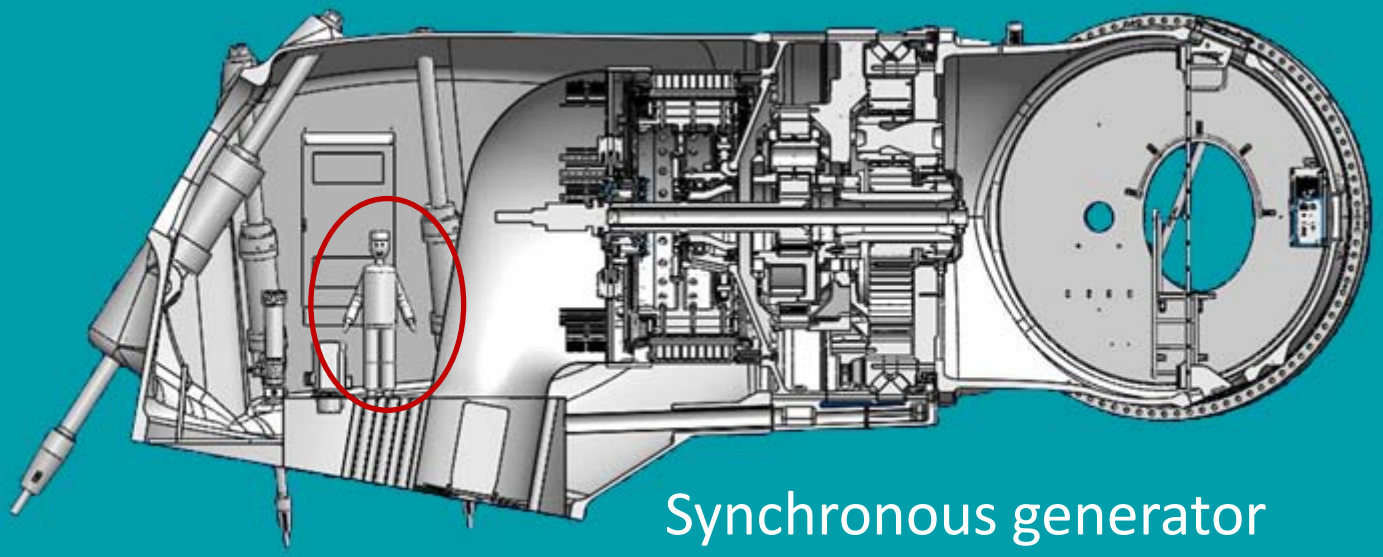


Tower shadow effect calculation

The next generation becomes reality

Why SCD-Technology?

Self-supporting generator and gearbox frames



Two stage planetary gearbox with flex pins

Decoupling of loads and gear deformation

No extra nacelle cover

Synchronous generator with exciting machine

Compact and light weight turbine with 300 t for 8.0 MW RNA (Rotor Nacelle Assembly) leads to a light weight foundation and system design.

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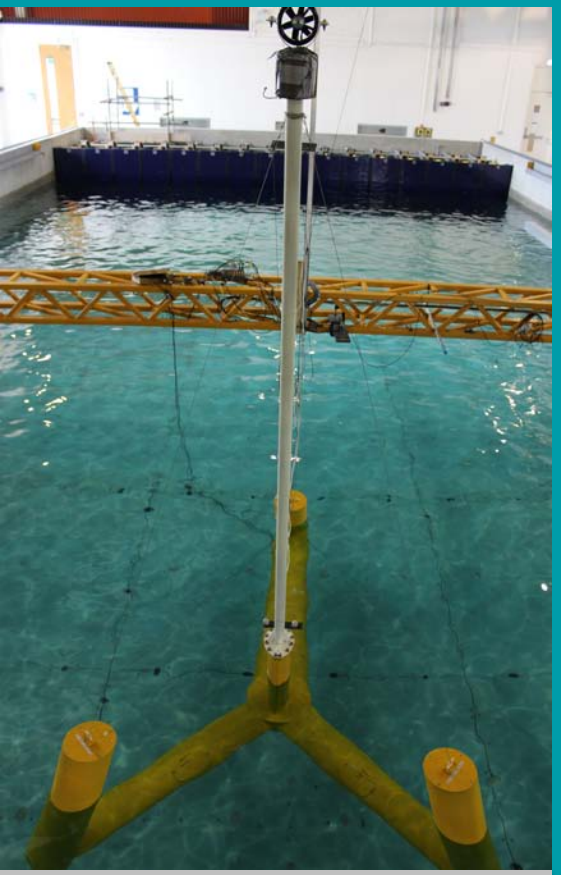
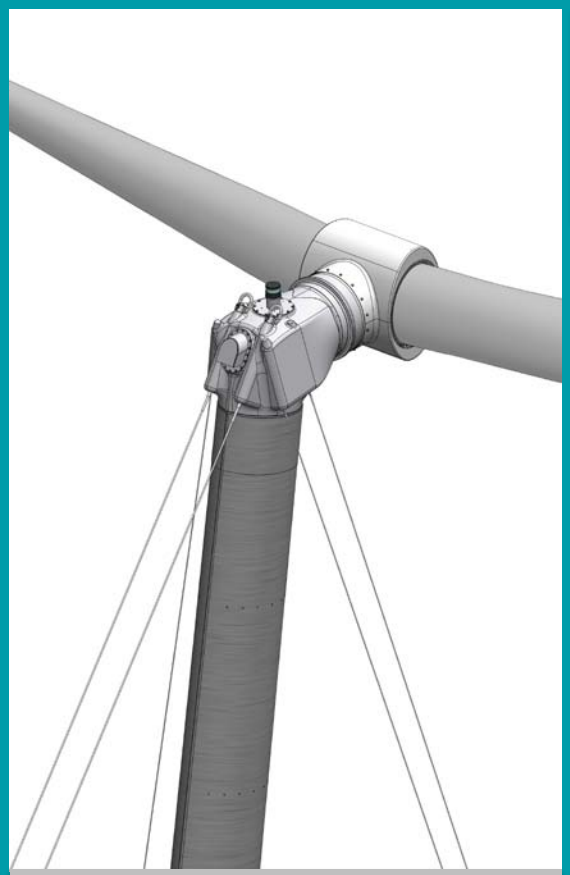
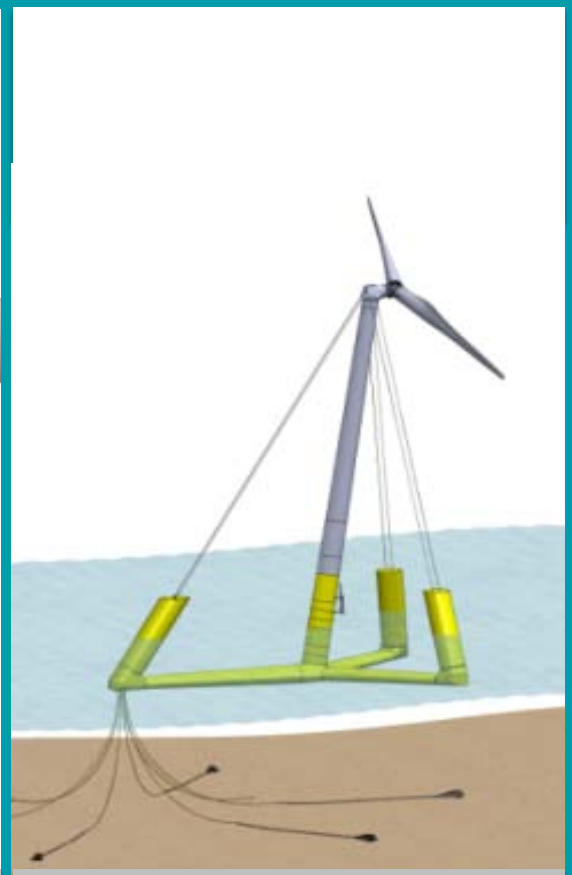
SCDnezzy development process



Phase 1
Scale 1:36



Phase 2
Scale 1:10 / 1:6



Phase 3
SCDnezzy 3.0 MW

Phase 4
SCDnezzy 8.0 MW

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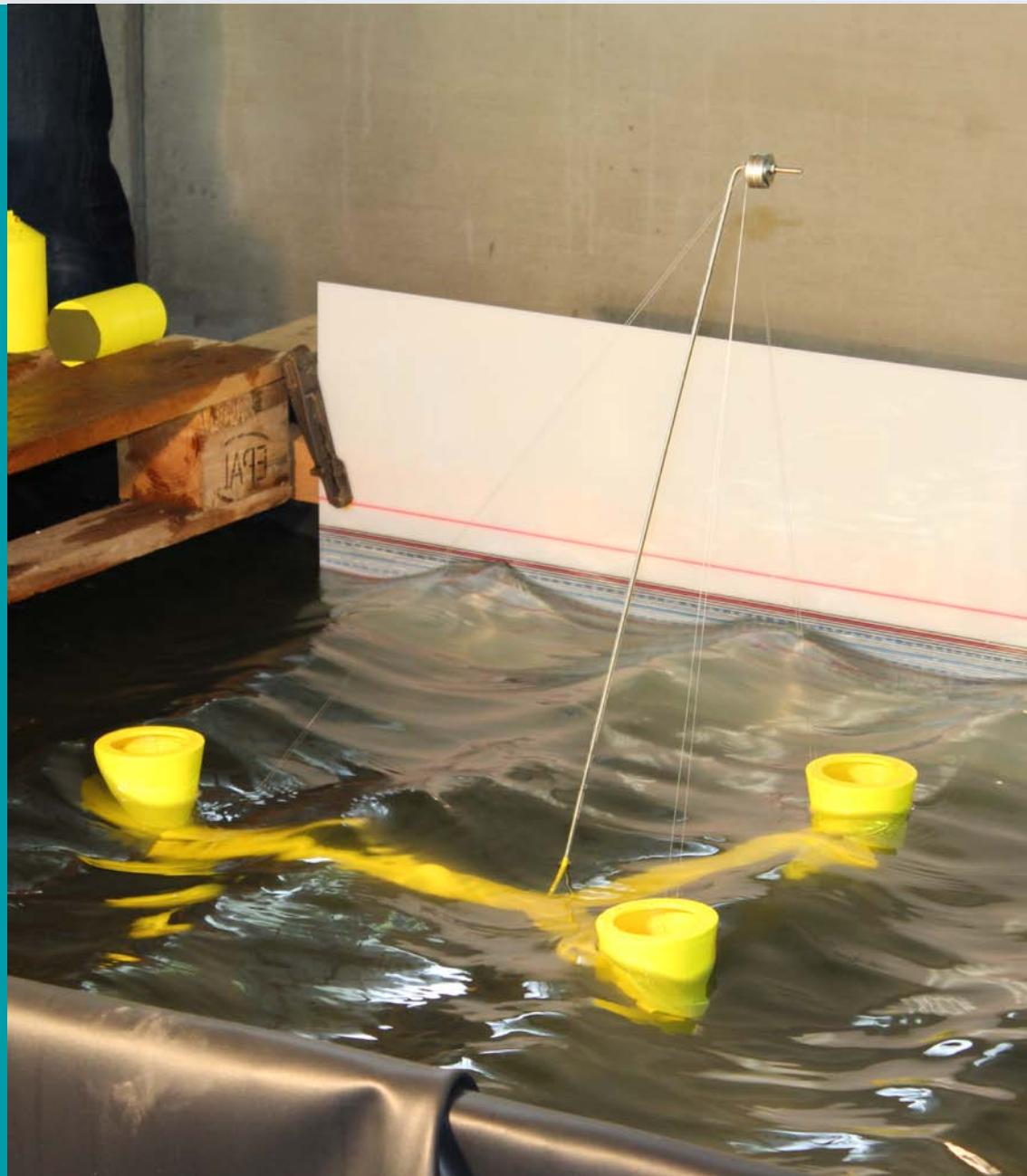
Feasibility study scale 1:200

Tank test:

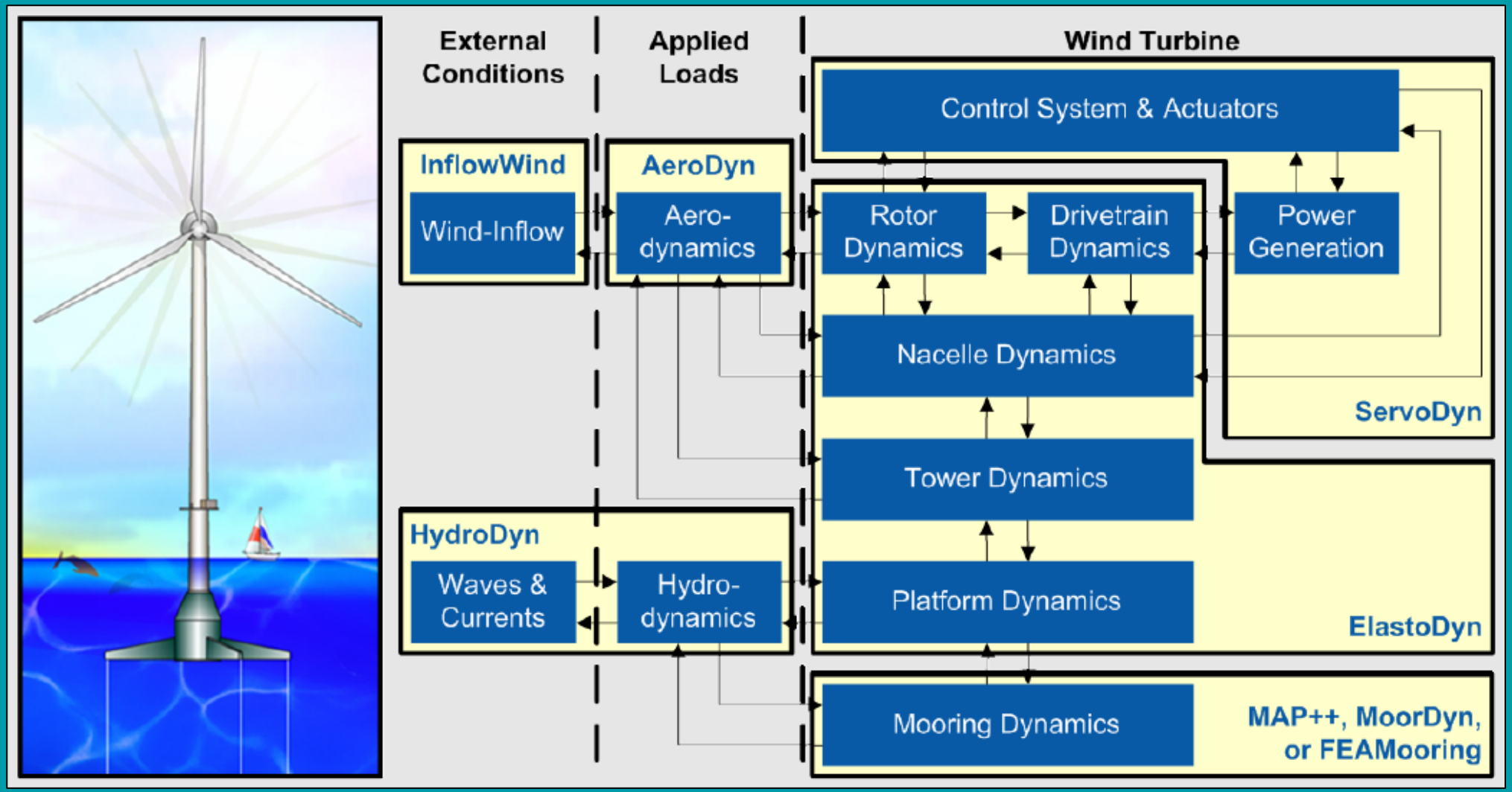
- Practical proof of concept
- Different floater arrangements
- Stability testing

Other works:

- Design check by DNV GL
- Creaton of nummerical model
- Software development



Simulation Approach



Source: NREL

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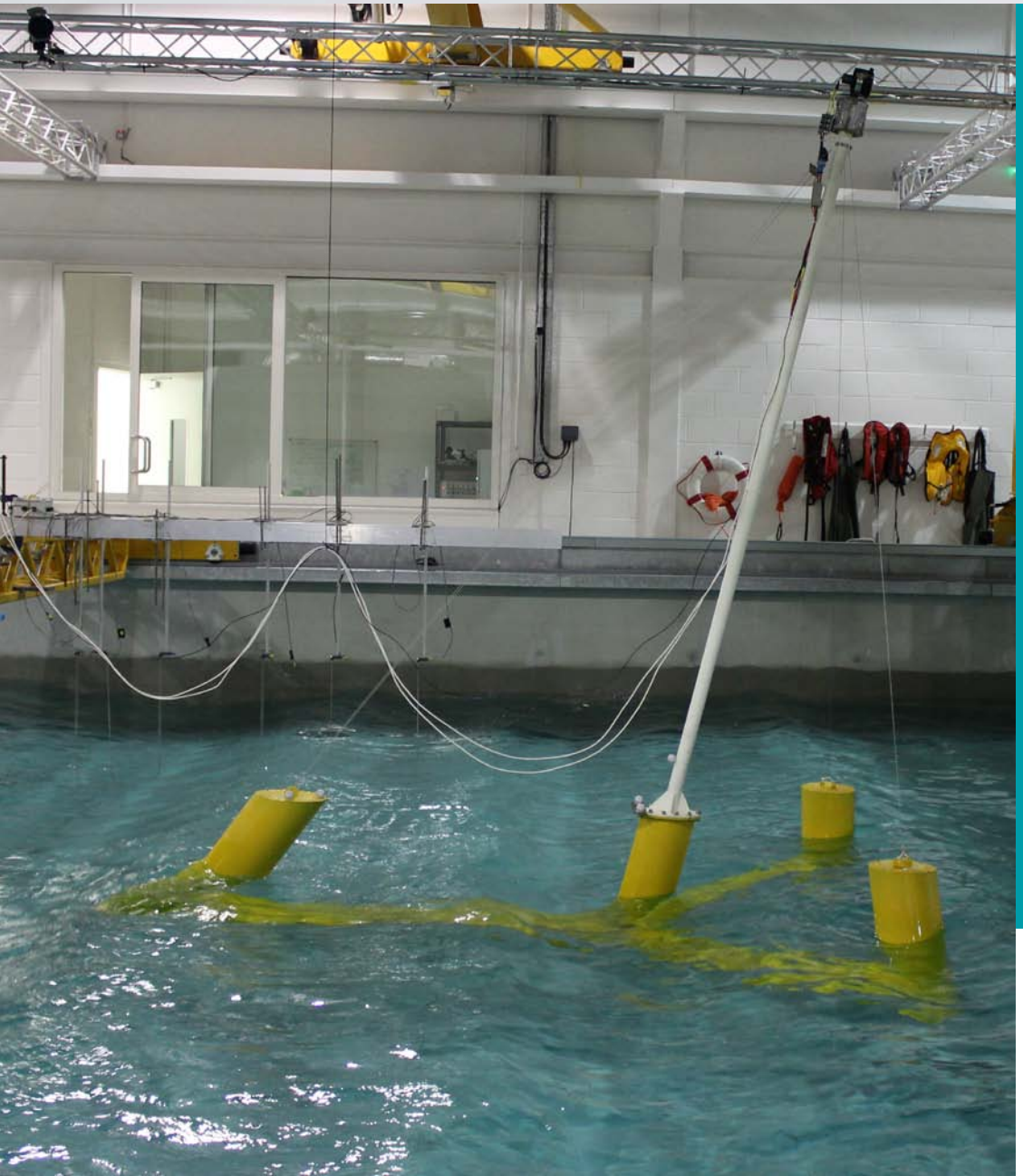

Phase 1: Tank test scale 1:36

- Performed at LiR, Cork,Ireland
- 15 days of testing
- Decay tests
- Response Amplitude Operator
- Regular/Irregular waves
- Survival testing
- Verification of numerical model
- Mooring analysis
- Wind/Wave misalignment test

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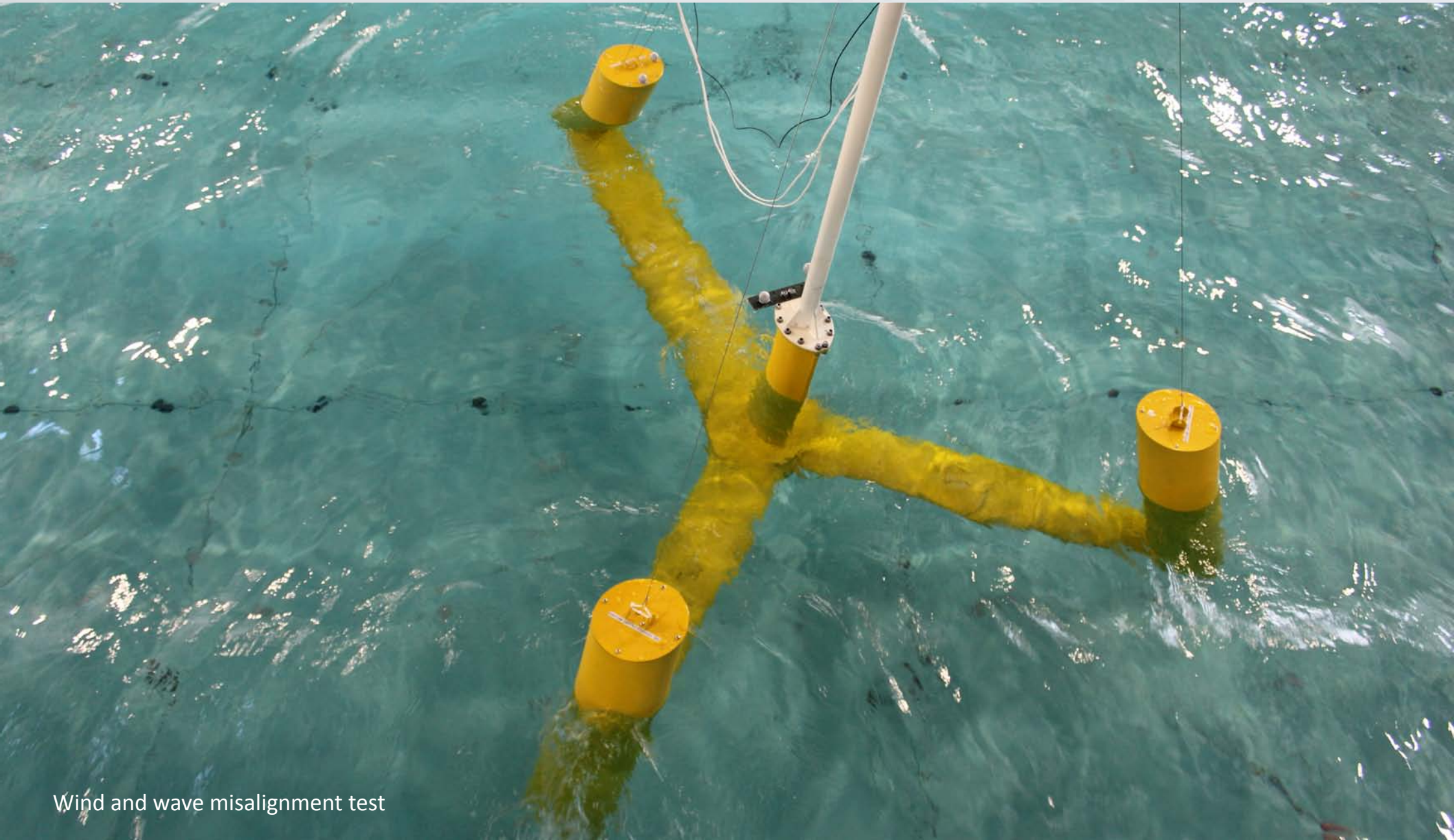


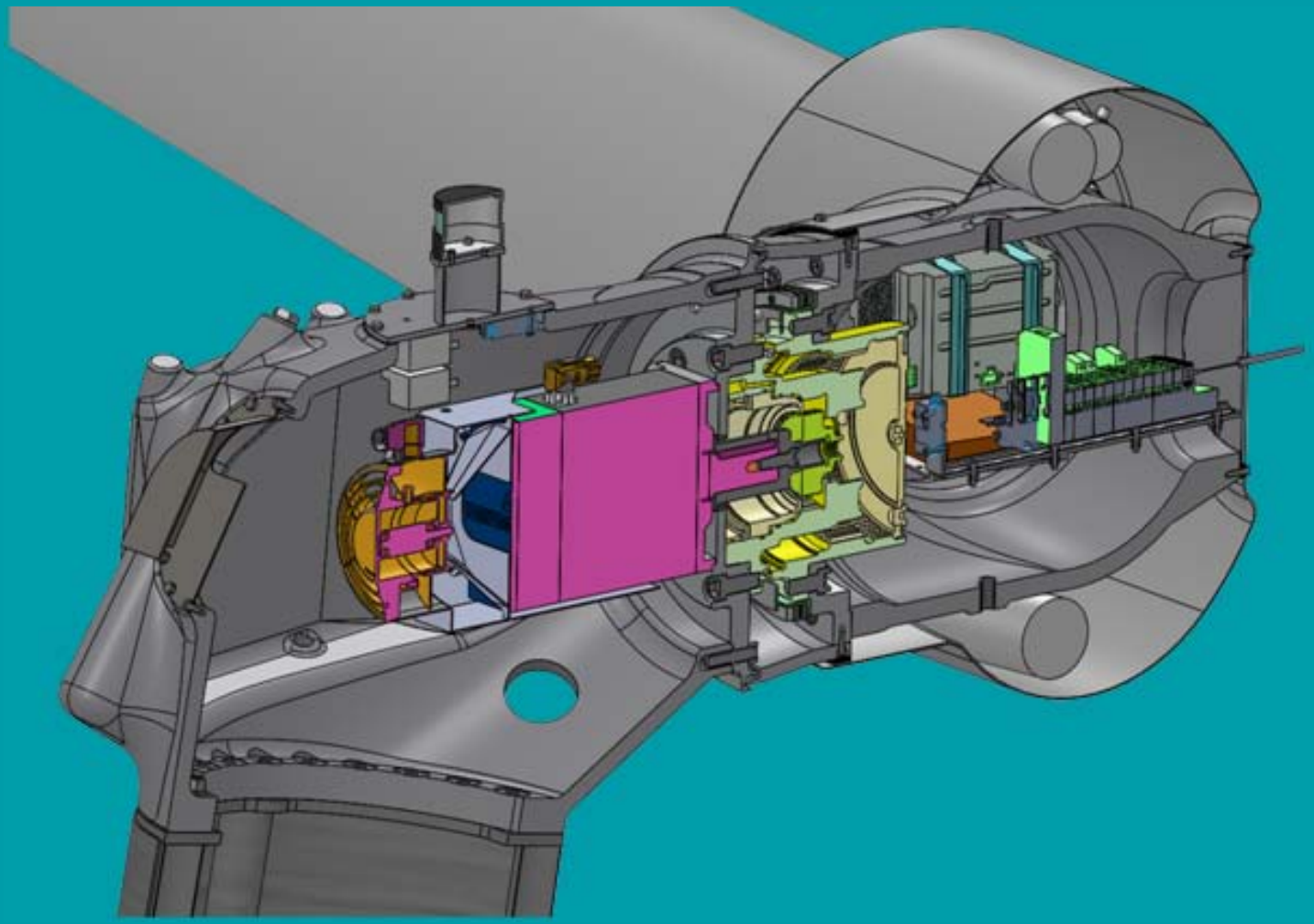
Wind and wave misalignment test

Phase 2: Scale 1:6 / 1:10

- Key design done
- First open water test next step
- Full instrumentation
- Advanced feasibility study for
  - Self alignment structure
  - Turret mooring
  - Slip ring
  - Used materials
  - Pretension
  - Towing
  - Installation

Scale 1:10

Phase 2: Scale 1:6 / 1:10 Drive train design



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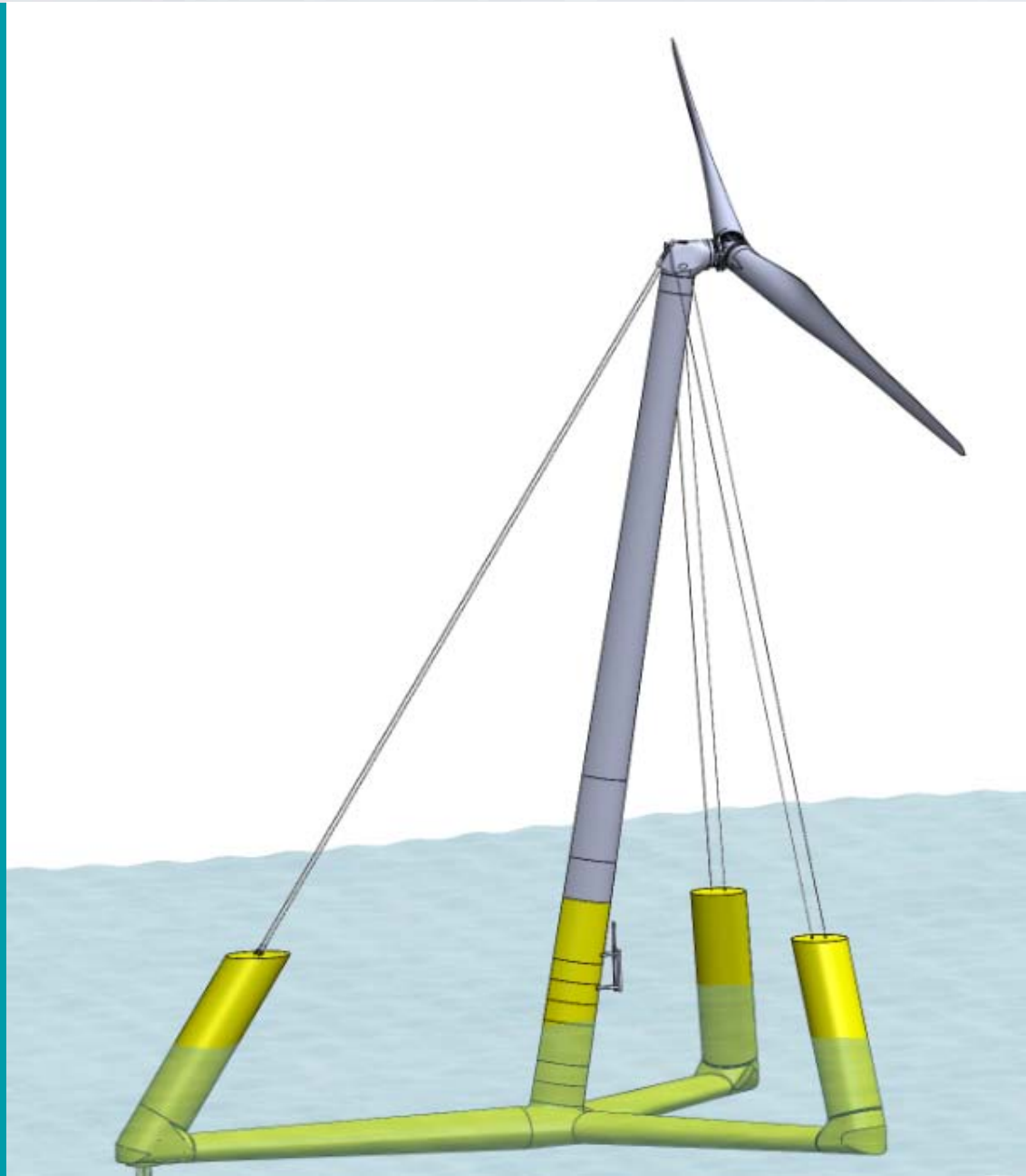
Phase 3: SCDnezzy 3.0 MW

- Available turbine design
- Onshore experience
- Proven technology
- First big scale manufacturing
- Pre-stressed structure
- Steel floaters
- Single point mooring
- Slip ring unit
- 58 m length, 39 m width
- System weight approx. 1000 t

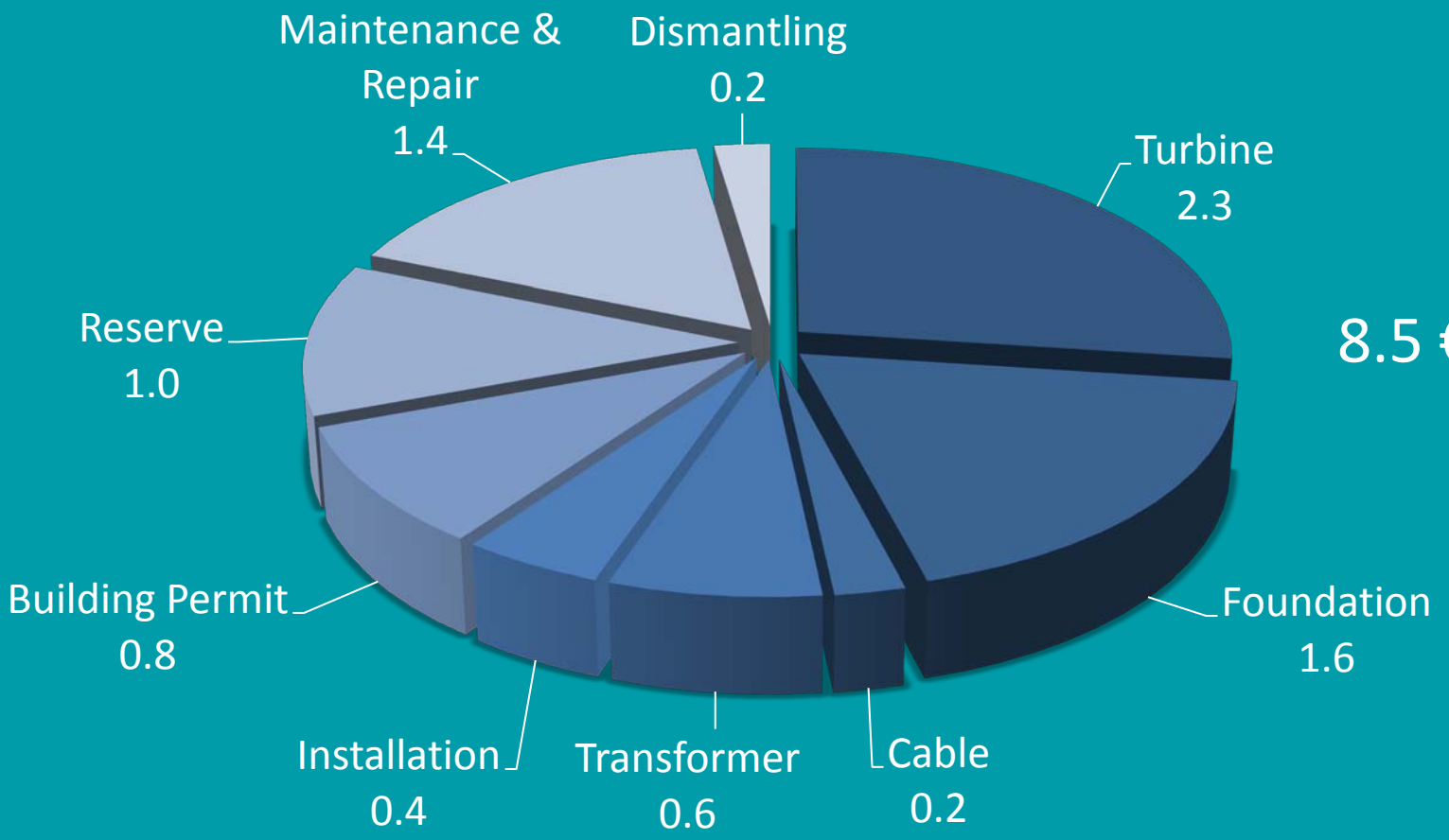


The next generation becomes reality

Practical experience: SCD 6.0 MW

Prototype at Rudong, China

Cost of electricity with SCDnezzy 8.0 MW in €cent per kWh



8.5 €cent / kWh

The next generation becomes reality

Reducing cost with SCDnezzy 8.0 MW

- Light weight SCD-Technology
- Using advantage floating technology
- Realizing 5-year maintenance interval
- Use of 2 blade downwind rotor
- Avoiding expensive vessels
- Minimizing dismantling expenses
- Reduces environmental footprint

Cost reduction up to 40% possible

Prototype installation
SCD 6.0 MW

SCD-Technology
One Step Ahead

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