



COST REDUCTION OF
FLOATING WIND TECHNOLOGY

Coupled analysis and optimization strategies for FOWT mooring and dynamic cable design

COREWIND webinar
21st April 2020

corewind.eu

Disclaimer:



This project has received funding from the European Union's Horizon 2020 Research and Innovation programme under grant agreement No 815083.

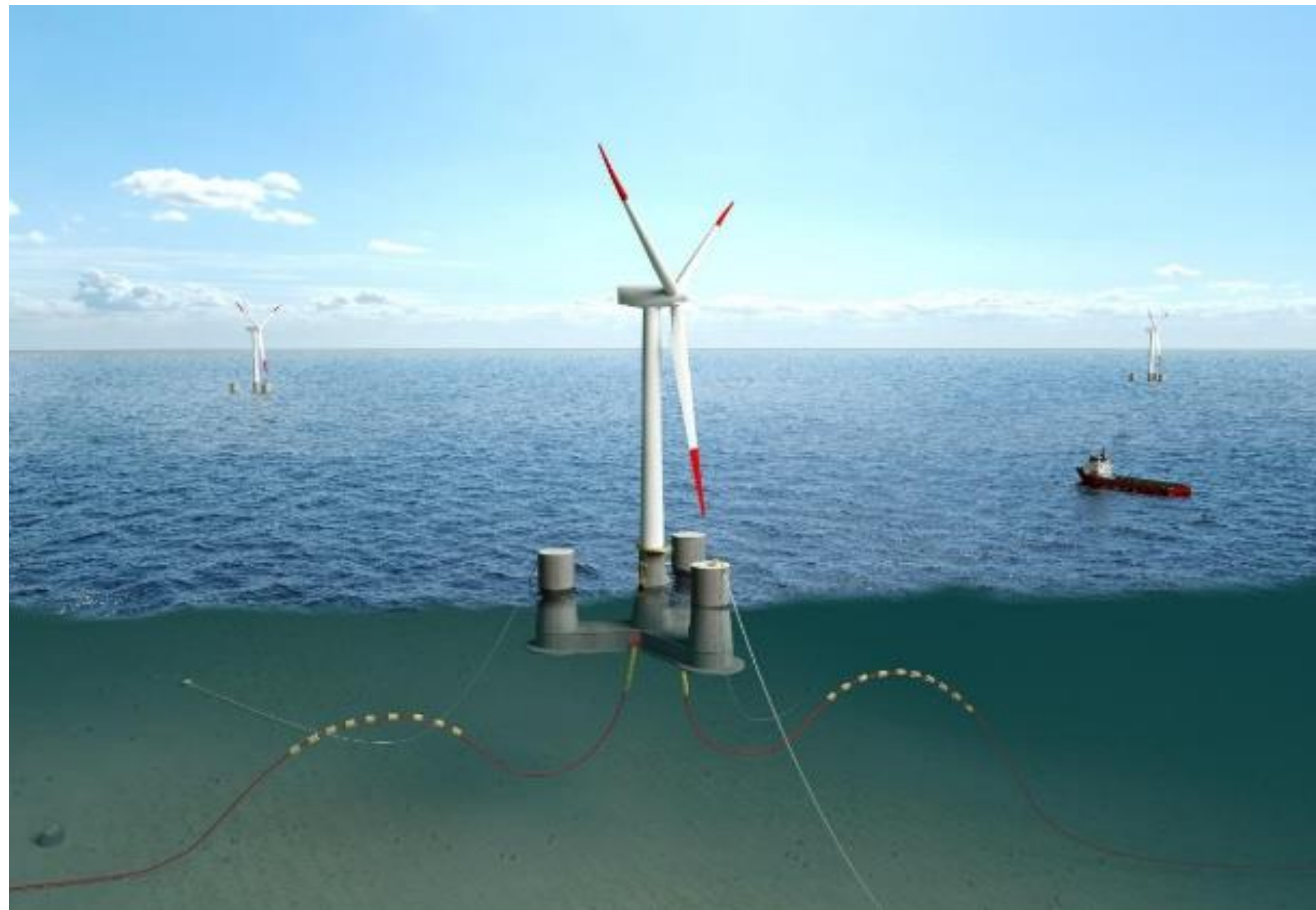
Project details:

Duration:
1 Sep 2019 - 28 Feb 2023
Grant agreement:
No: 815083

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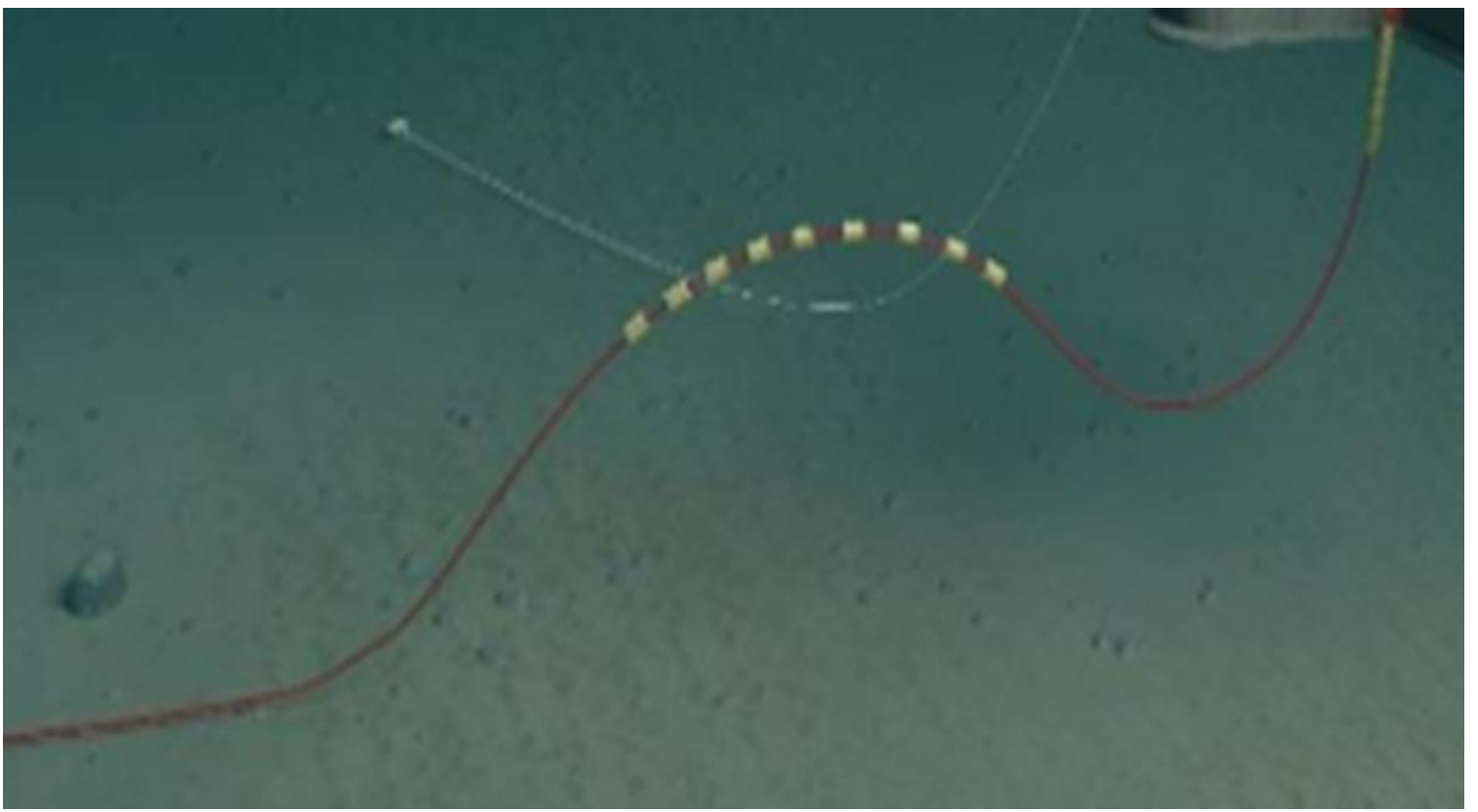
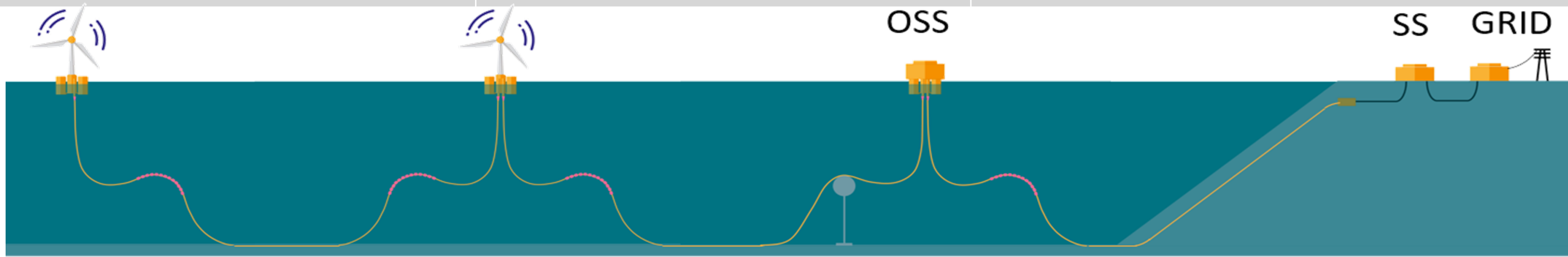
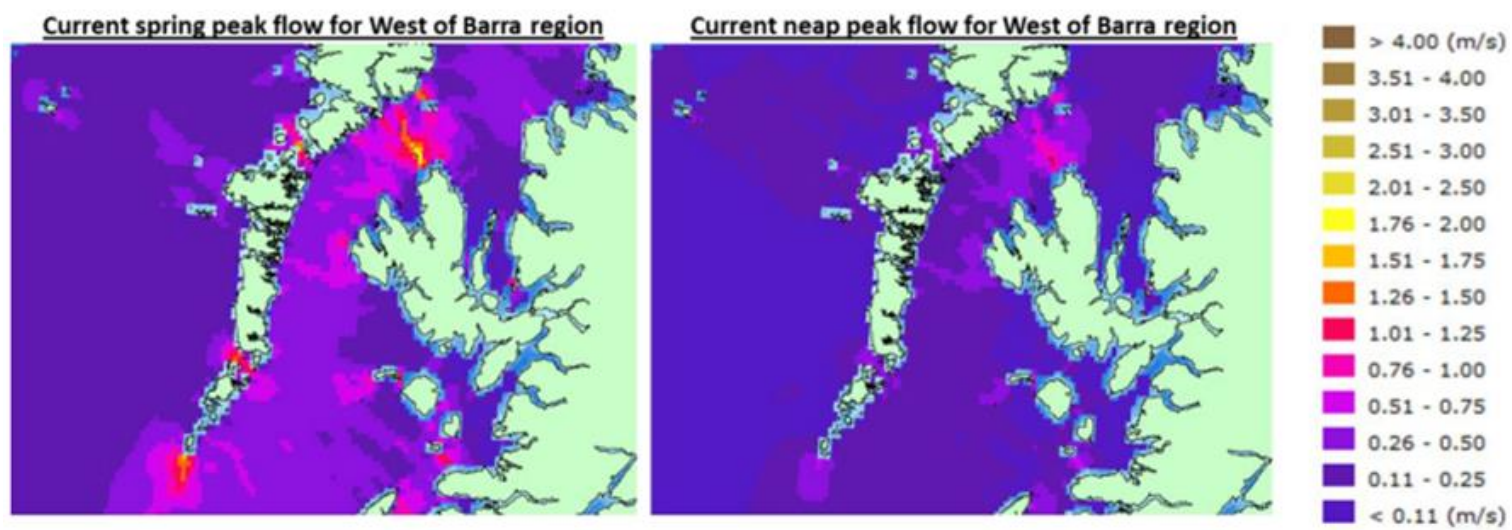
Aim

Cost optimization of the offshore wind turbine mooring and cable systems



Configuration Design and Cost Drivers

Configuration Drivers	Mooring System	Cabling System
Floater Type	YES	NO
Connection points	YES	YES
Metocean conditions	YES	YES
Excursion limitations	YES	YES
Water depth	YES	YES
Marine Growth	YES	YES
Fatigue	YES	YES
Bend / Torsion Limits	YES	YES
Peak Loading	YES at Anchor	YES at TDP and FC
Clashing Avoidance	YES	YES
Seabed Movement	YES – limit disruption	YES – protect TDP
Cost of Ancillaries	YES	YES
Cost of Installation	YES	YES



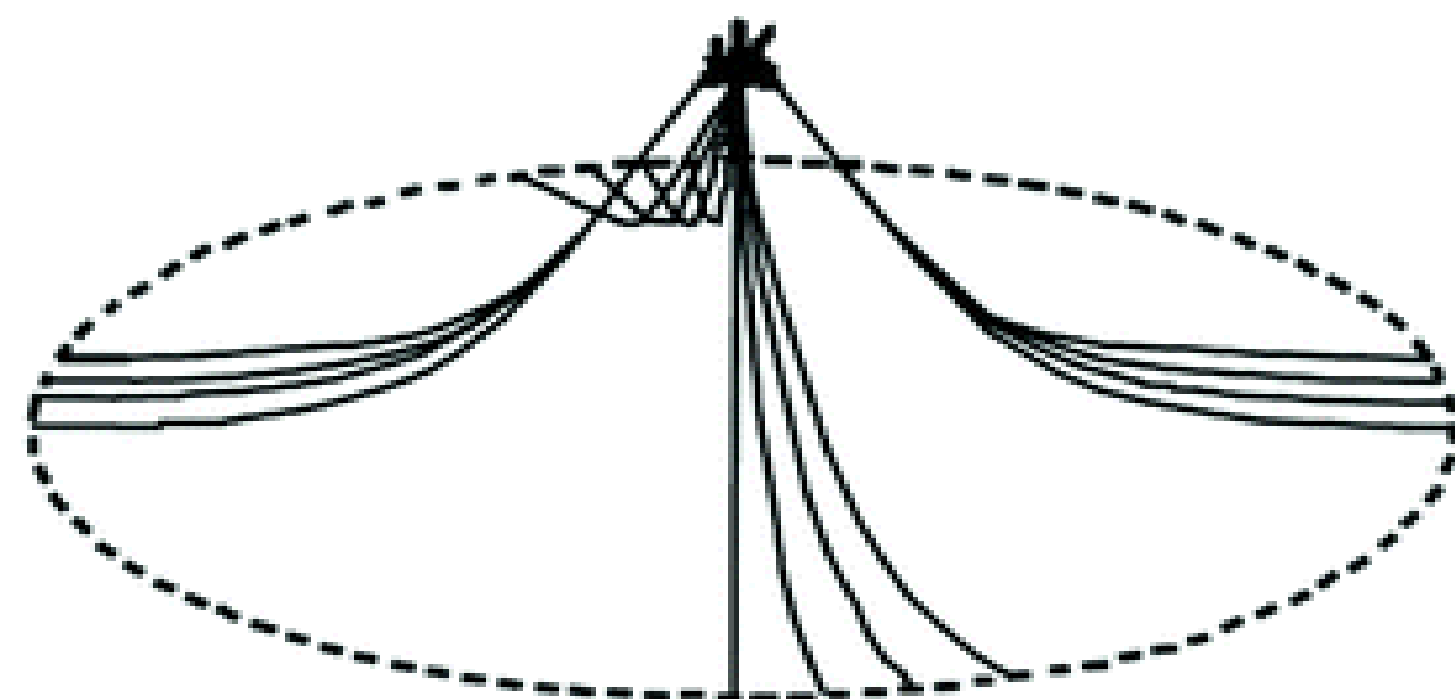
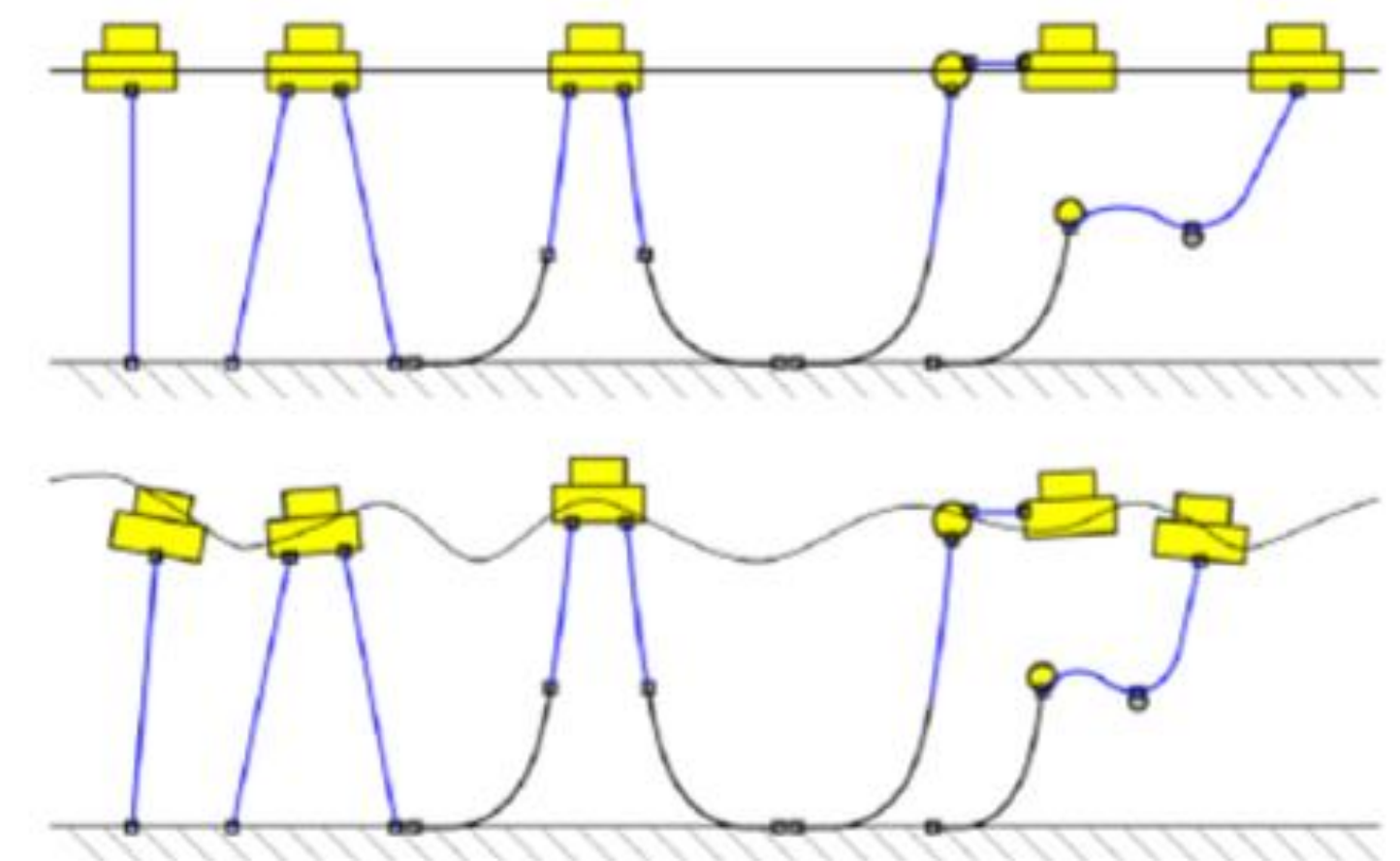
Subsea Array Cables

Subsea Export Cable

Optimizing Systems – Mooring Configuration

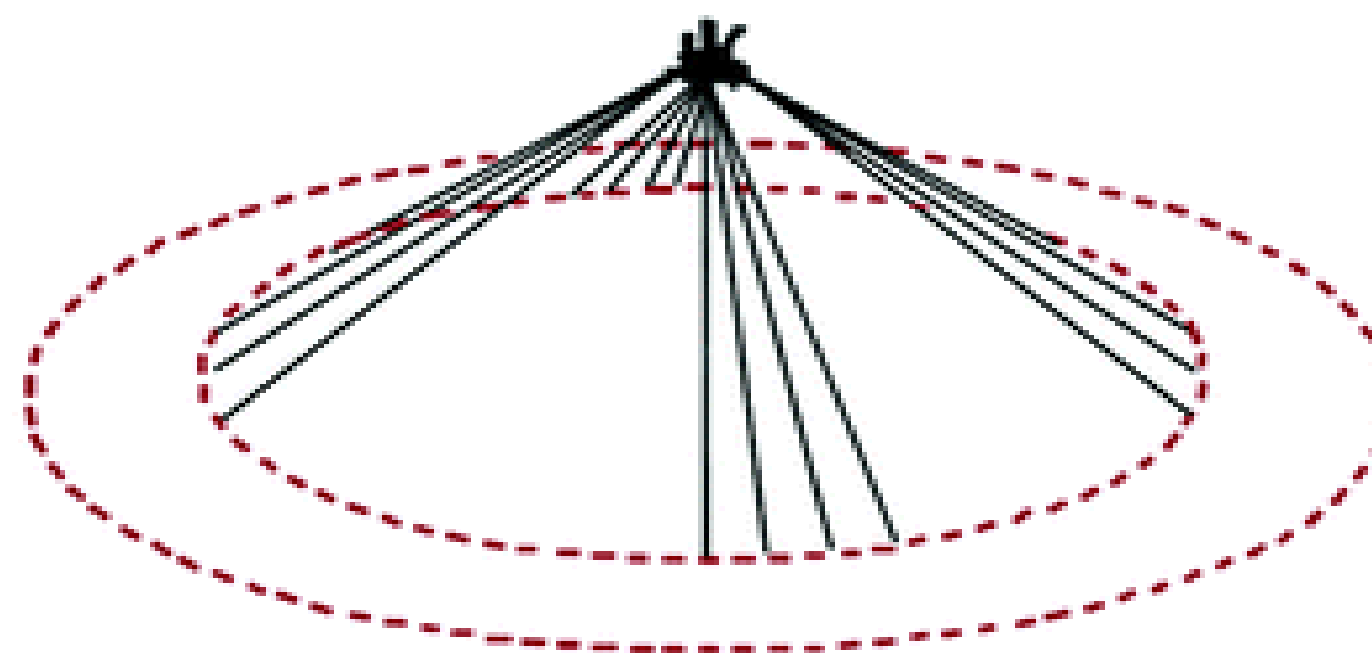
Mooring configuration a complex trade-off, considering:

- Platform dynamics / associated turbine cost
- Complexity and costs of the anchoring system
- Environmental loading, marine growth, water depth
- Standard compliance and integrity of design



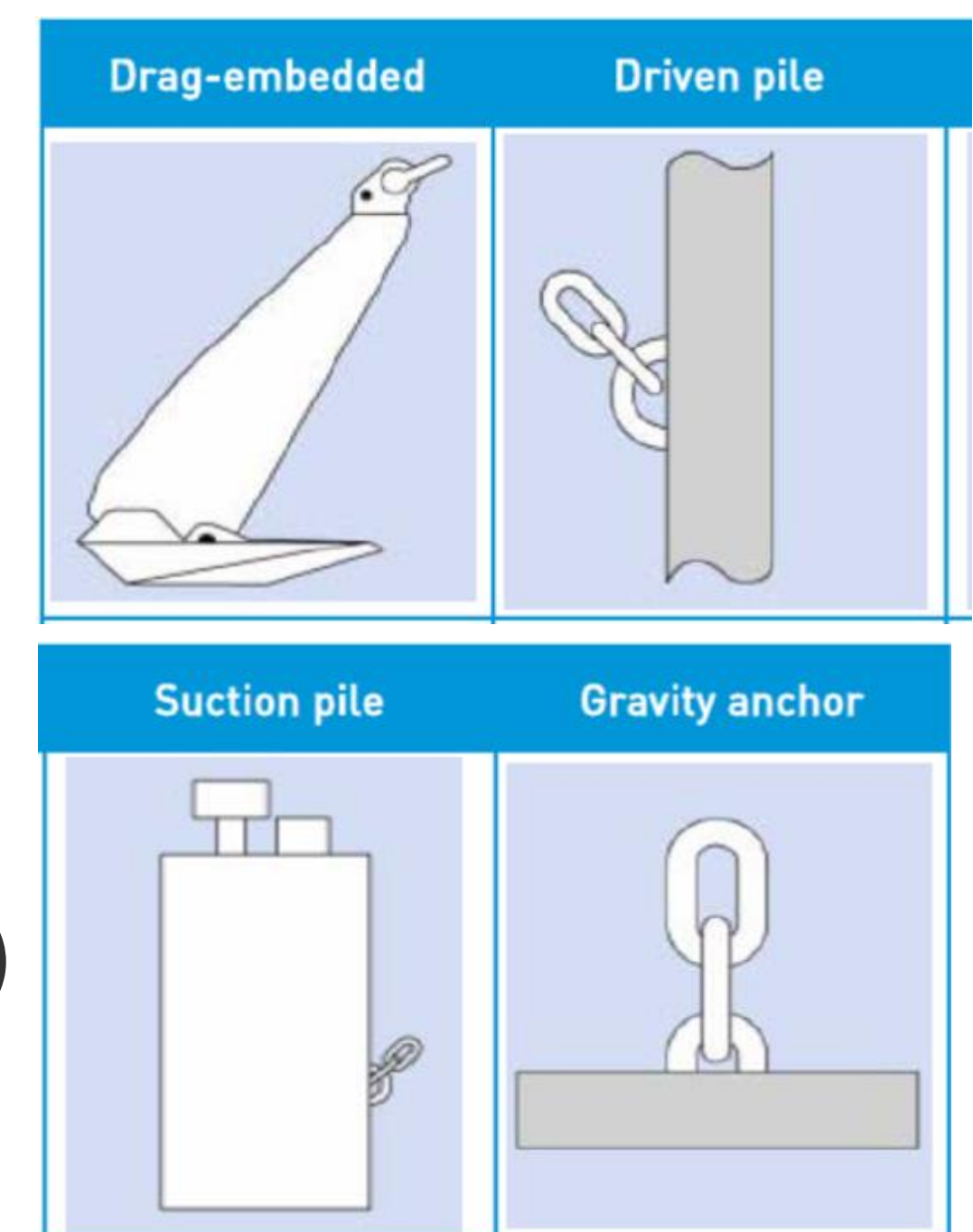
Catenary Mooring

- Long Steel Chains or Wires
- Impact to marine life
chain near / resting on seabed
- Lower Anchor Costs.
- Larger Horizontal Movement



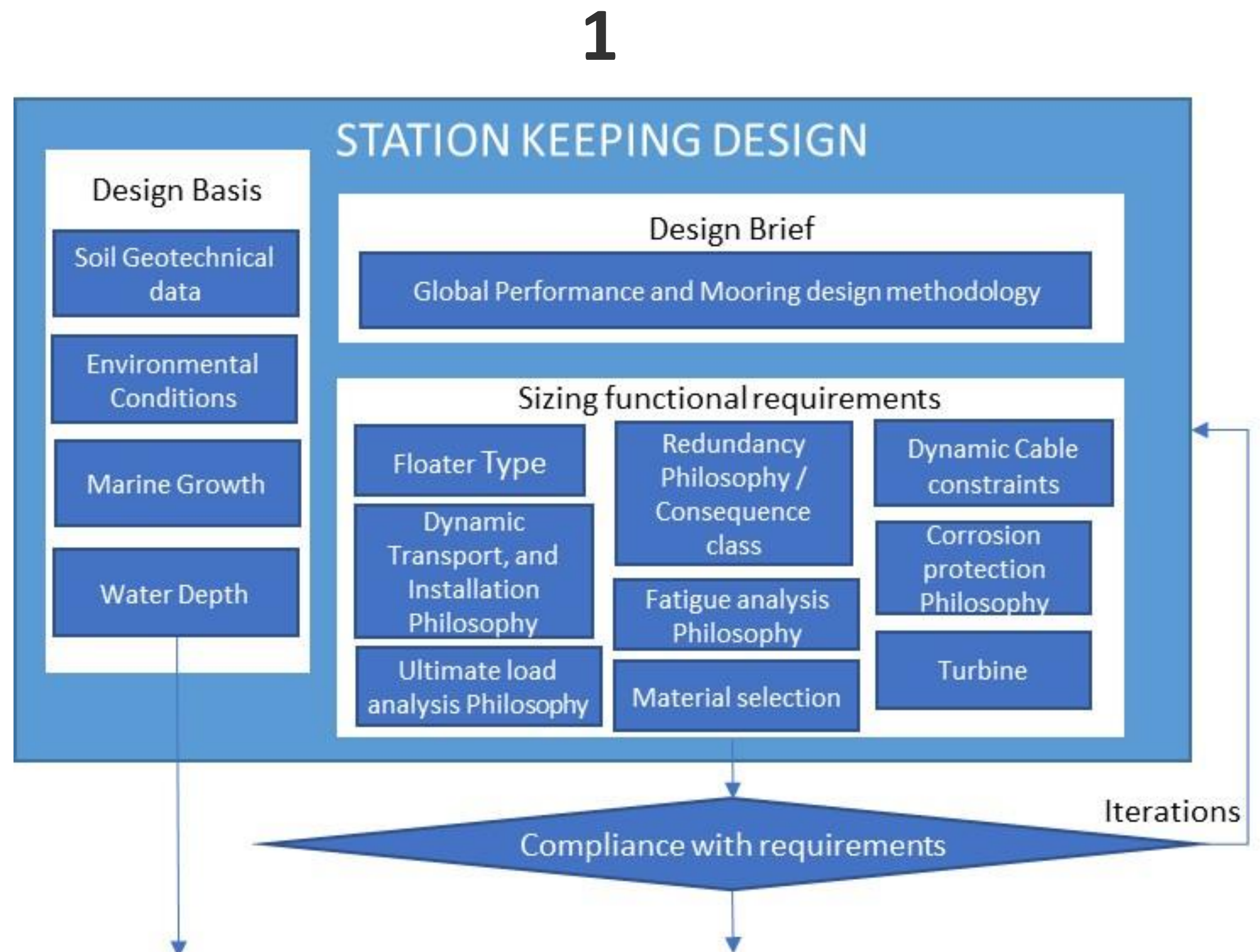
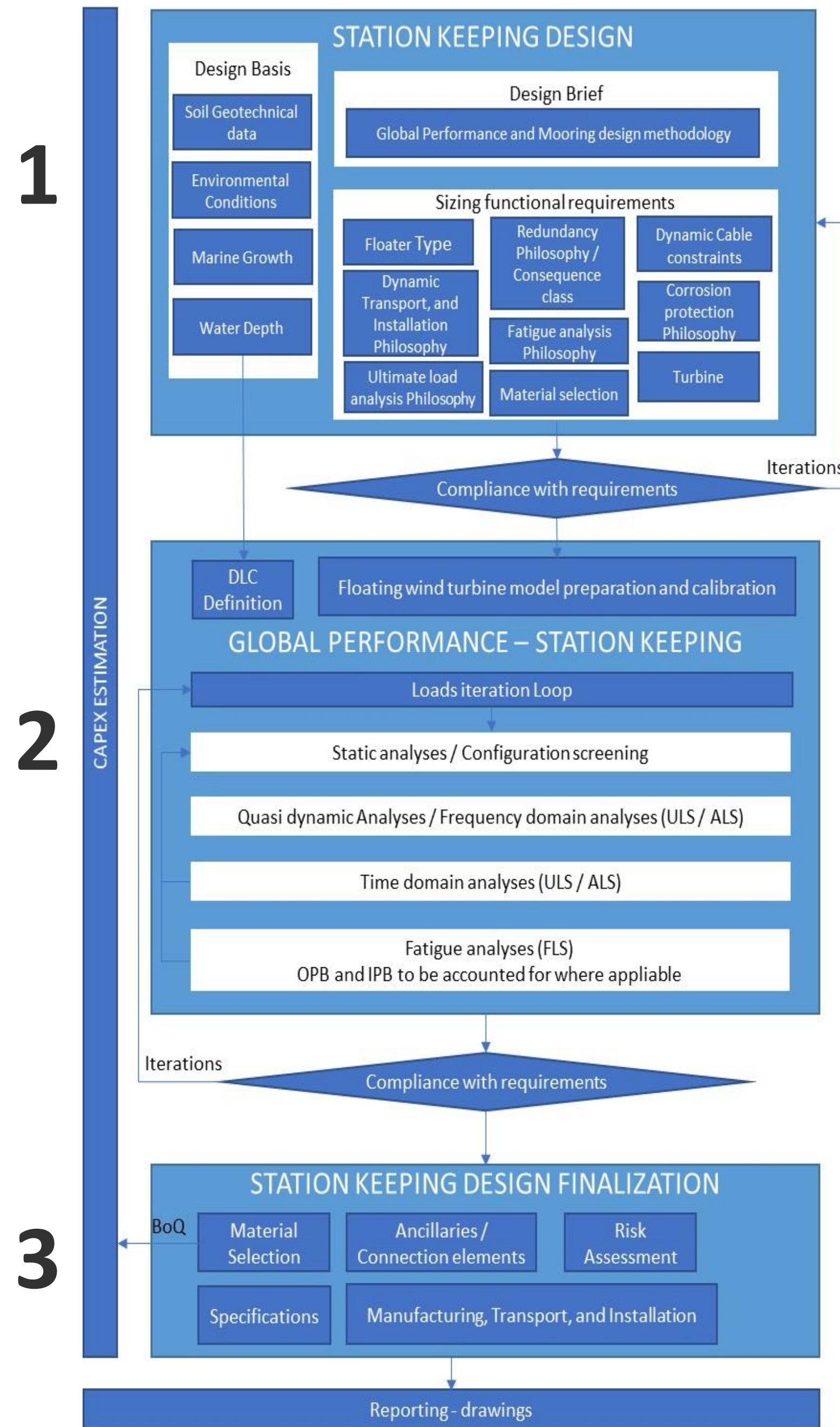
Taut Mooring

- Synthetic Fibres or Wire
- Lower impact to marine life
(lower footprint / seabed disruption)
- Large Anchor Costs as Higher Loads.
- Limited Horizontal Movement

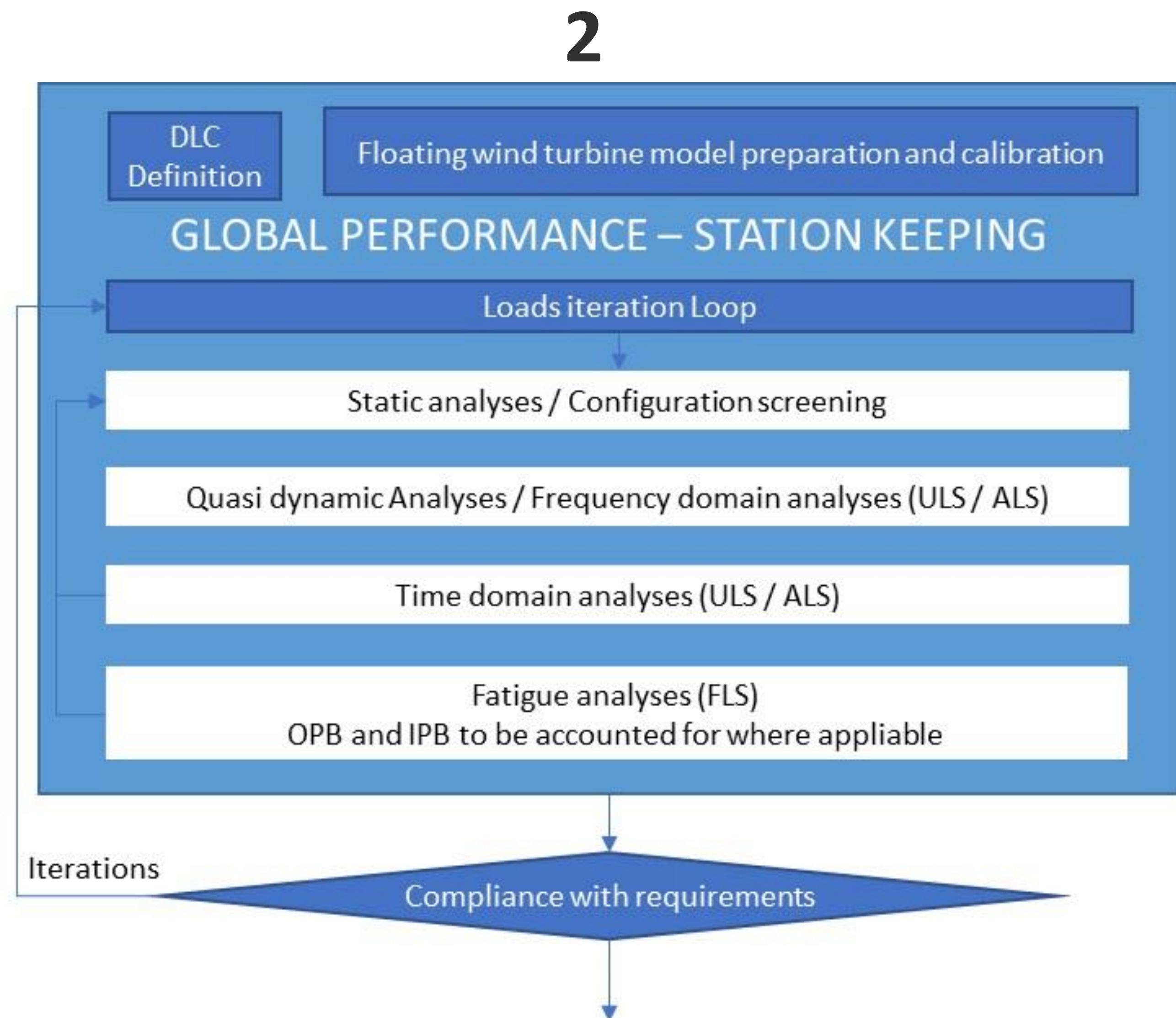
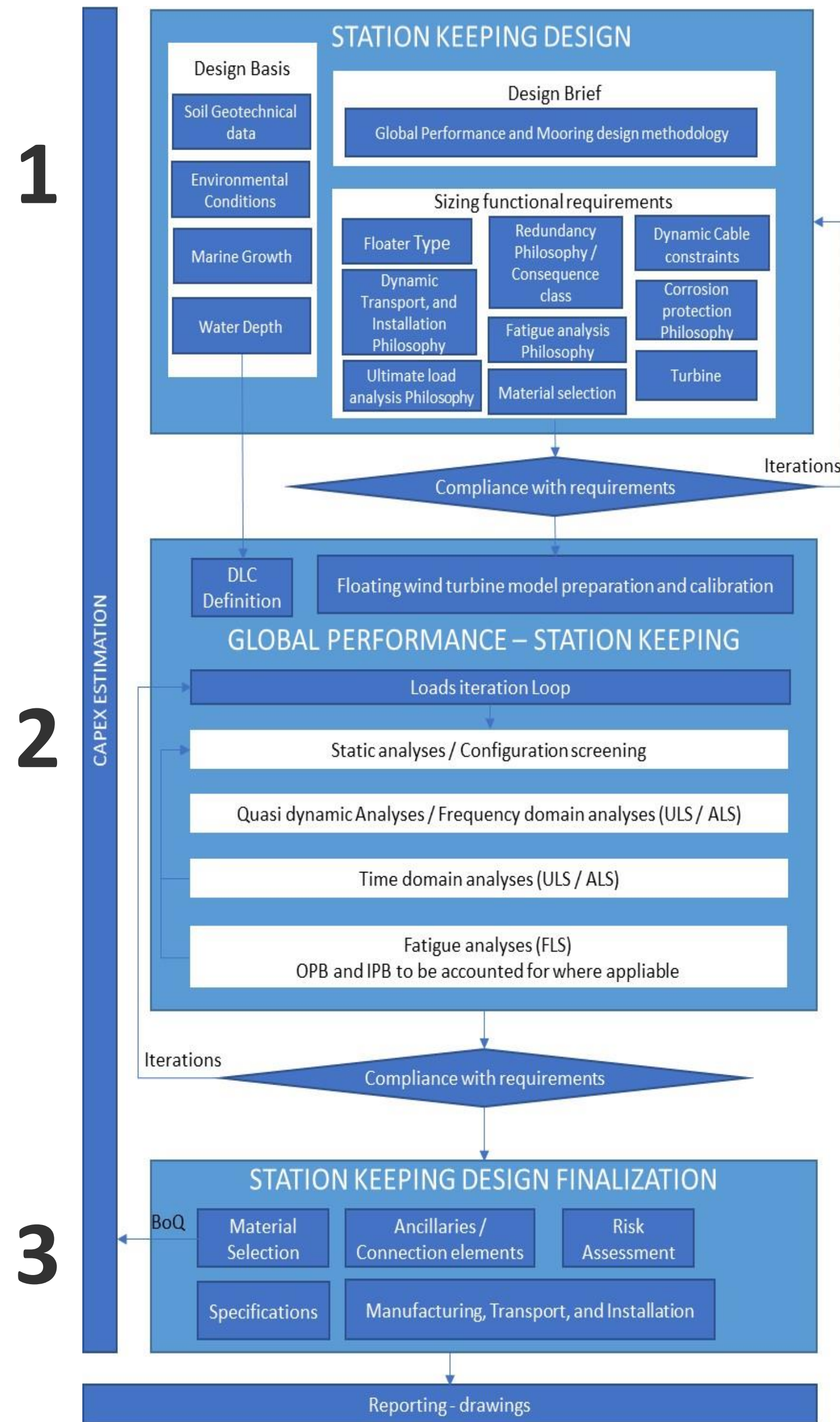


COST DRIVER TO DESIGN IS PRIMARILY MATERIAL COST OF MOORING COMPONENTS

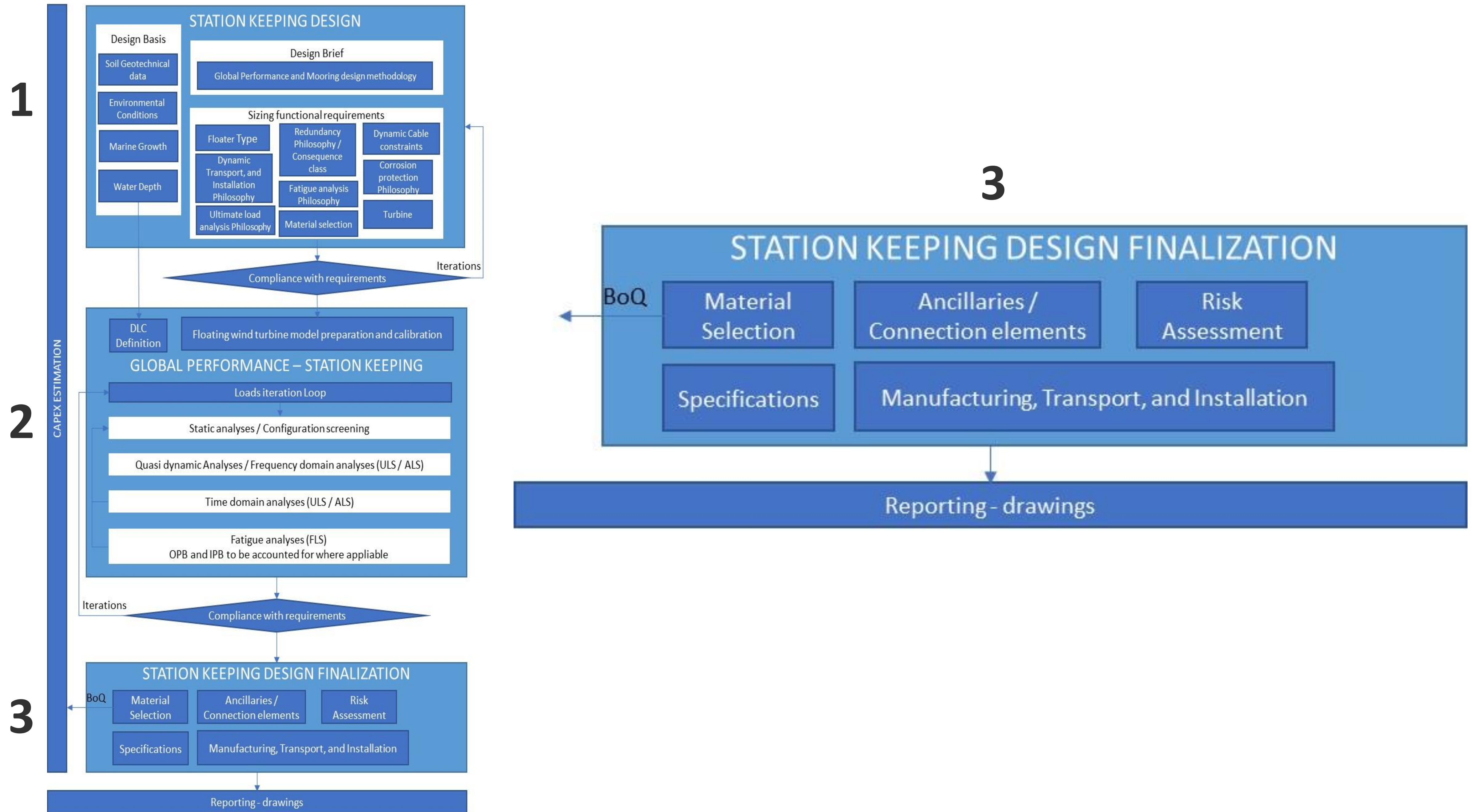
Mooring Design Process



Mooring Design Process

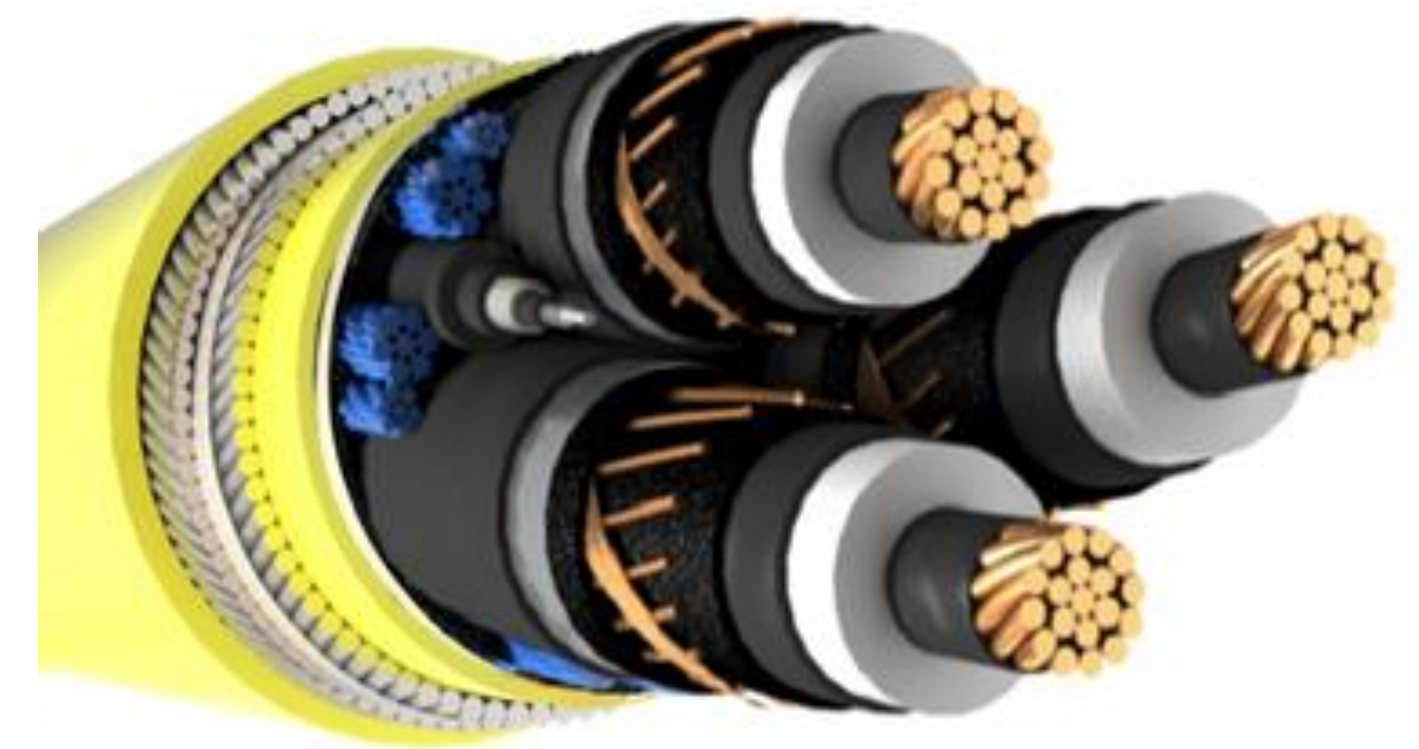
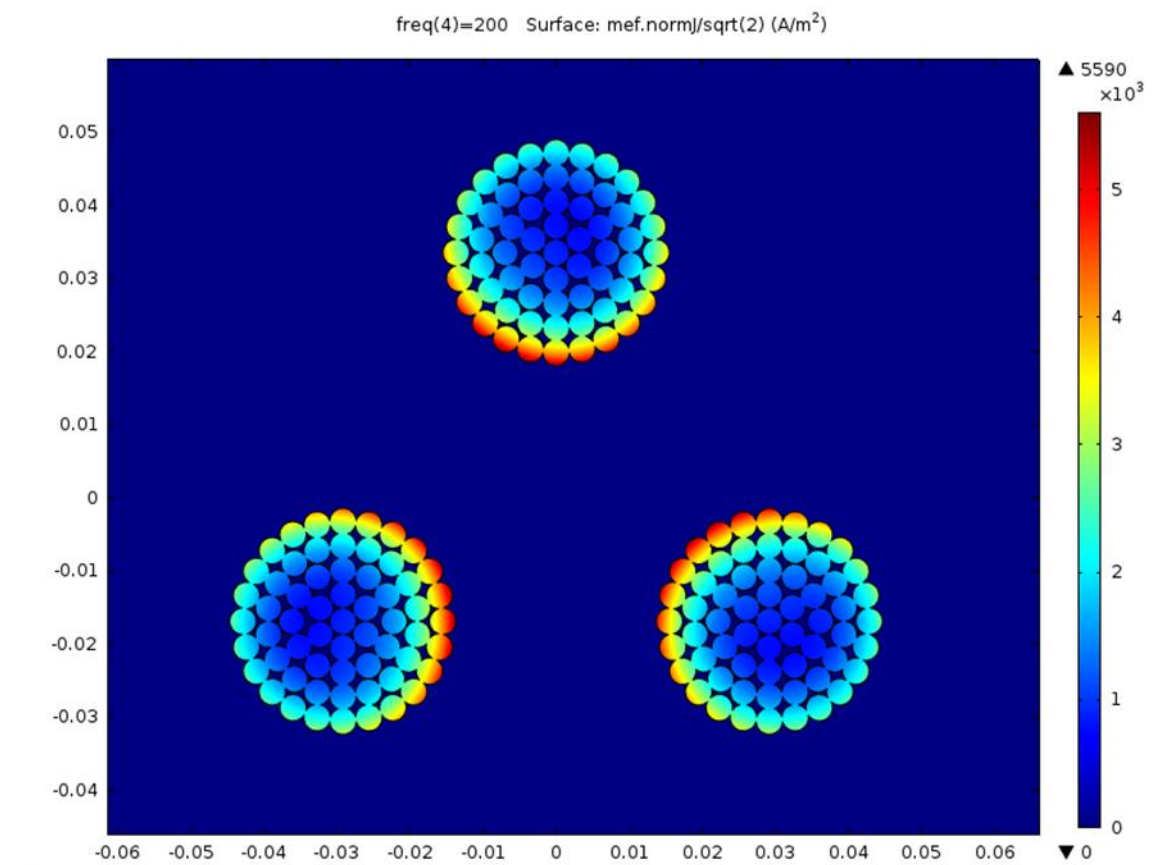


Mooring Design Process



Cable Design Process

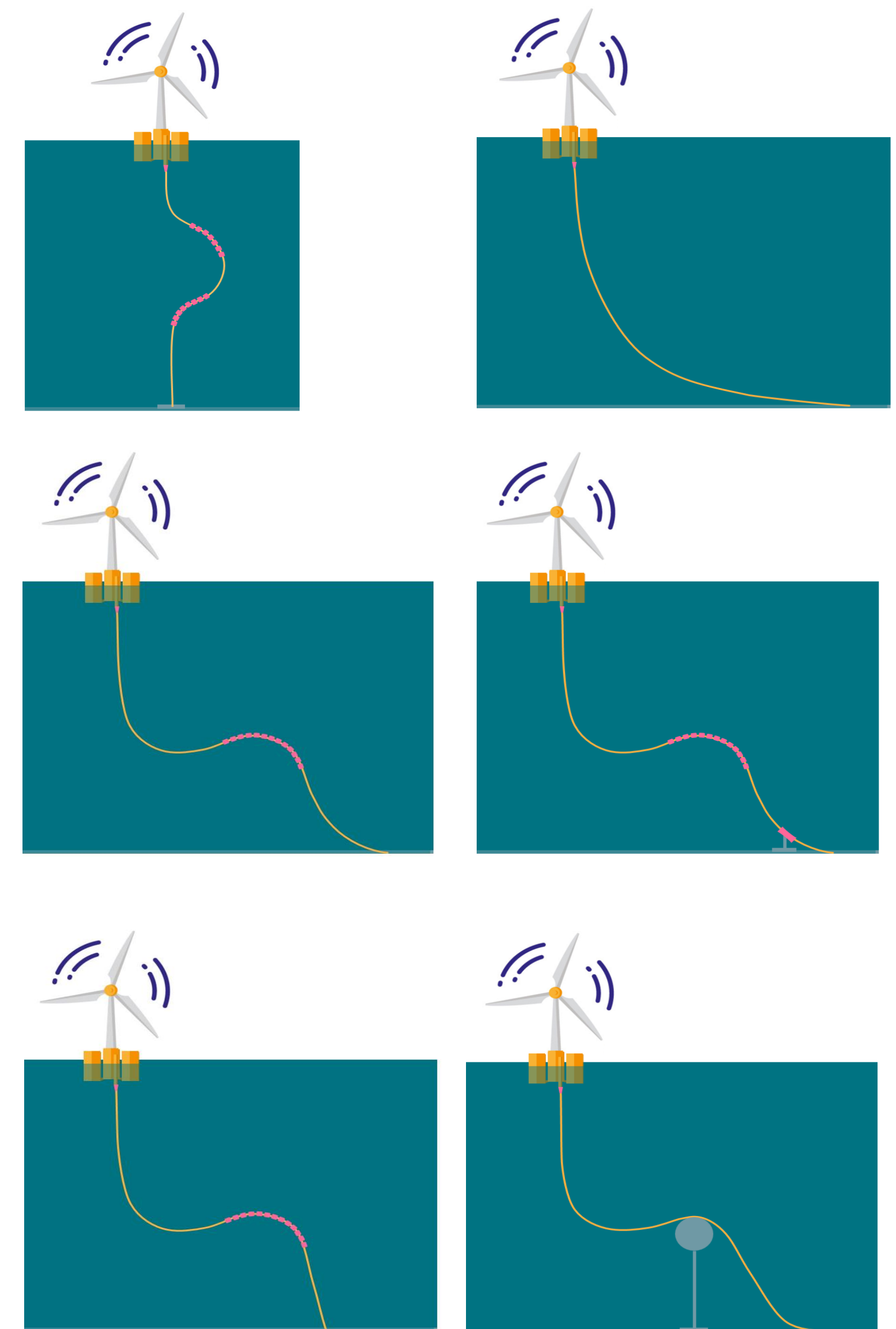
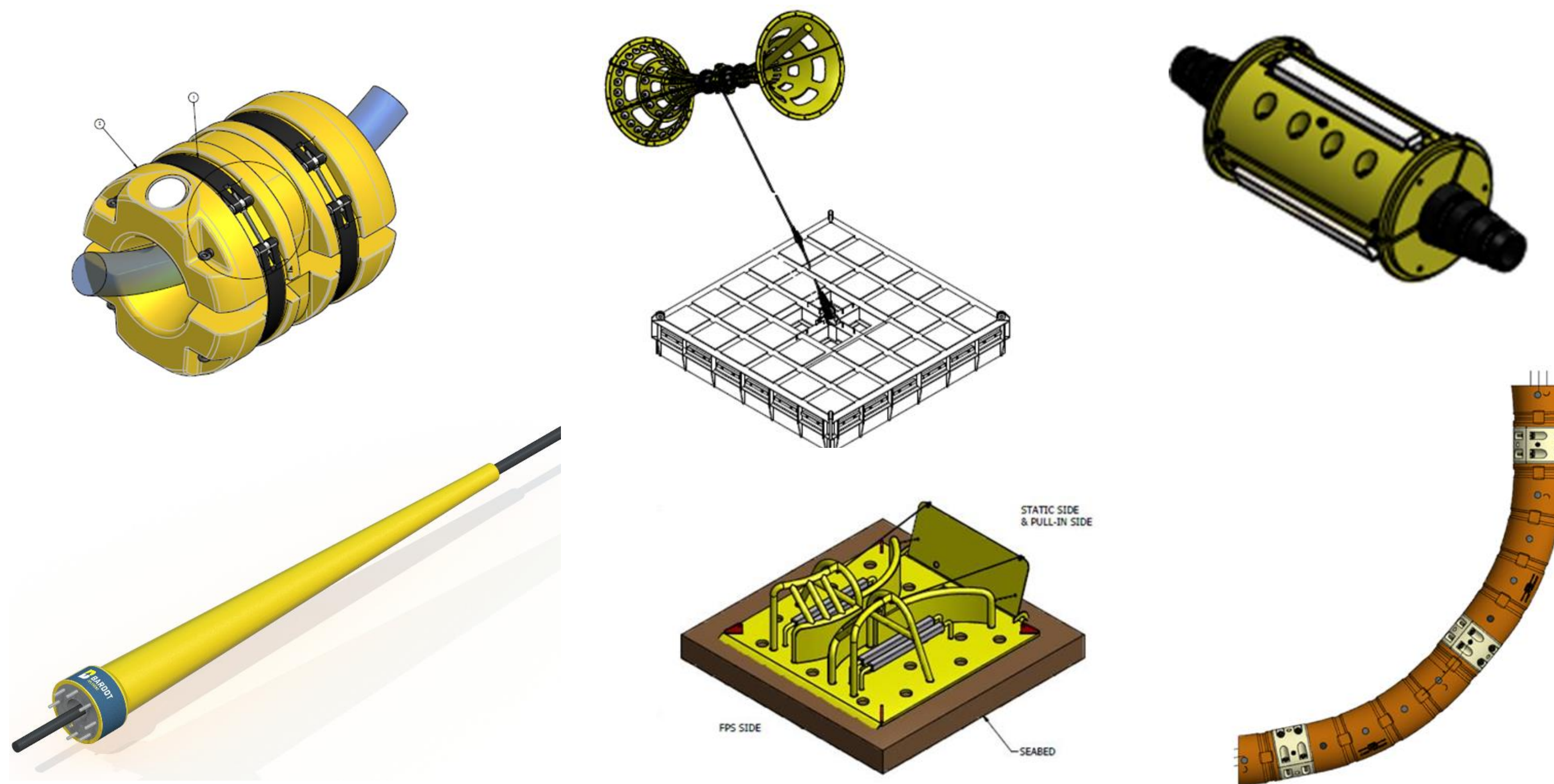
- Electrical parameters
 - Current loading
 - Voltage
 - Losses and ratings optimisation
- Mechanical parameters
 - Torque balance
 - Tensile capacity
 - Bending resilience
- Material selection
 - Design life qualification
 - Dynamic performance



Optimizing Systems – Cable Configuration

Cable configuration a complex trade-off considering:

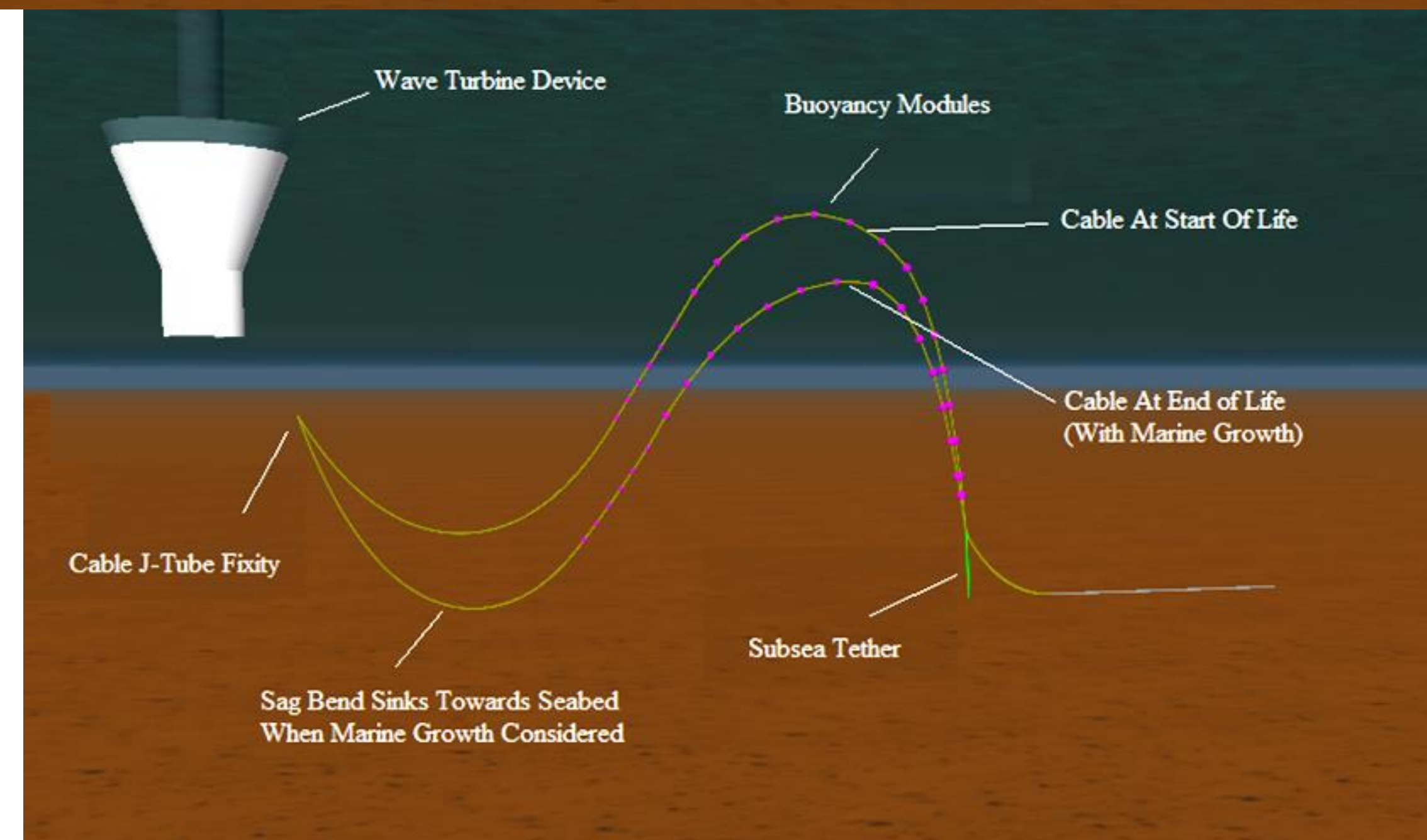
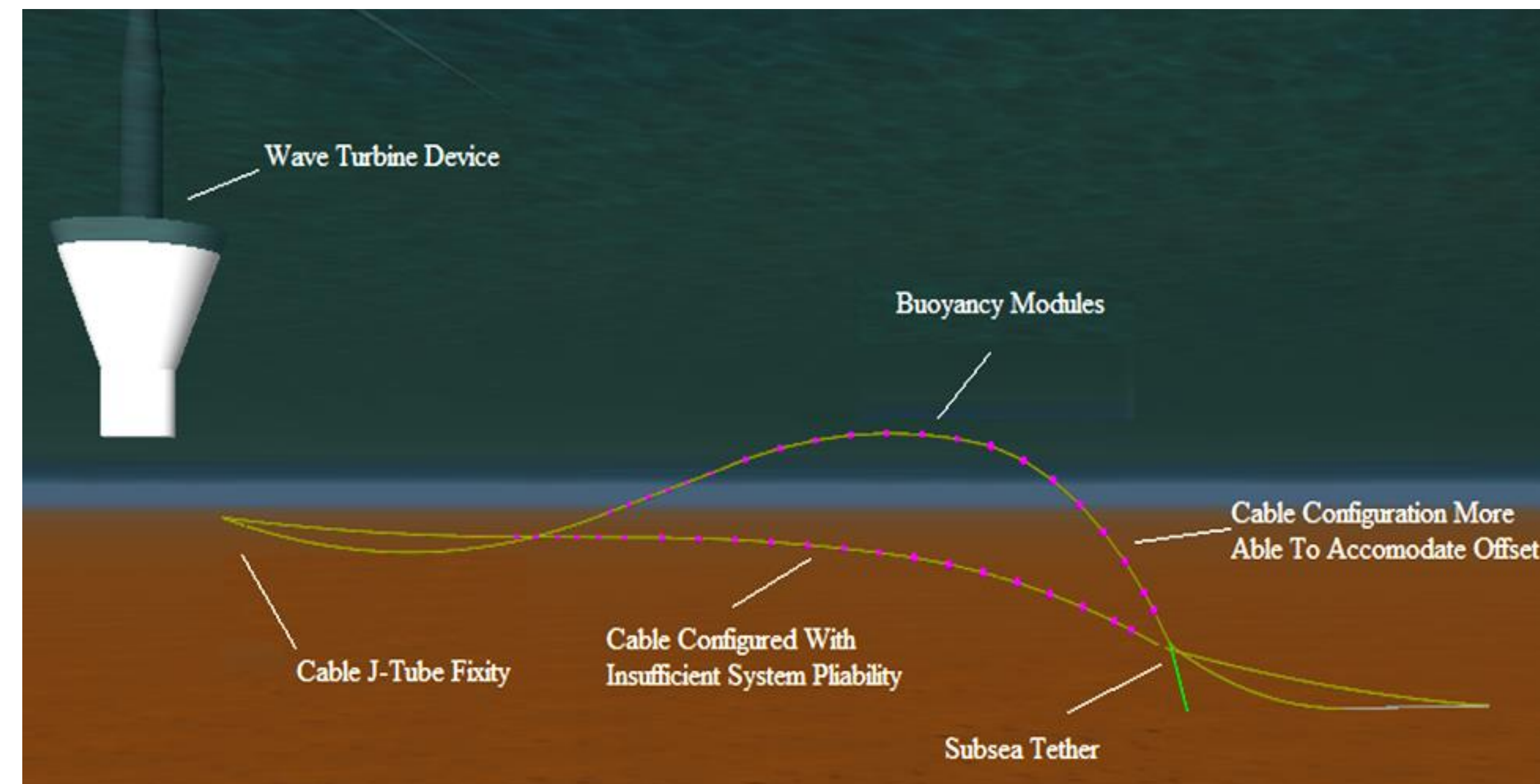
- System complexity and variation
- Platform excursions
- Water depth
- Environmental loading, marine growth
- Standard compliance and integrity of design



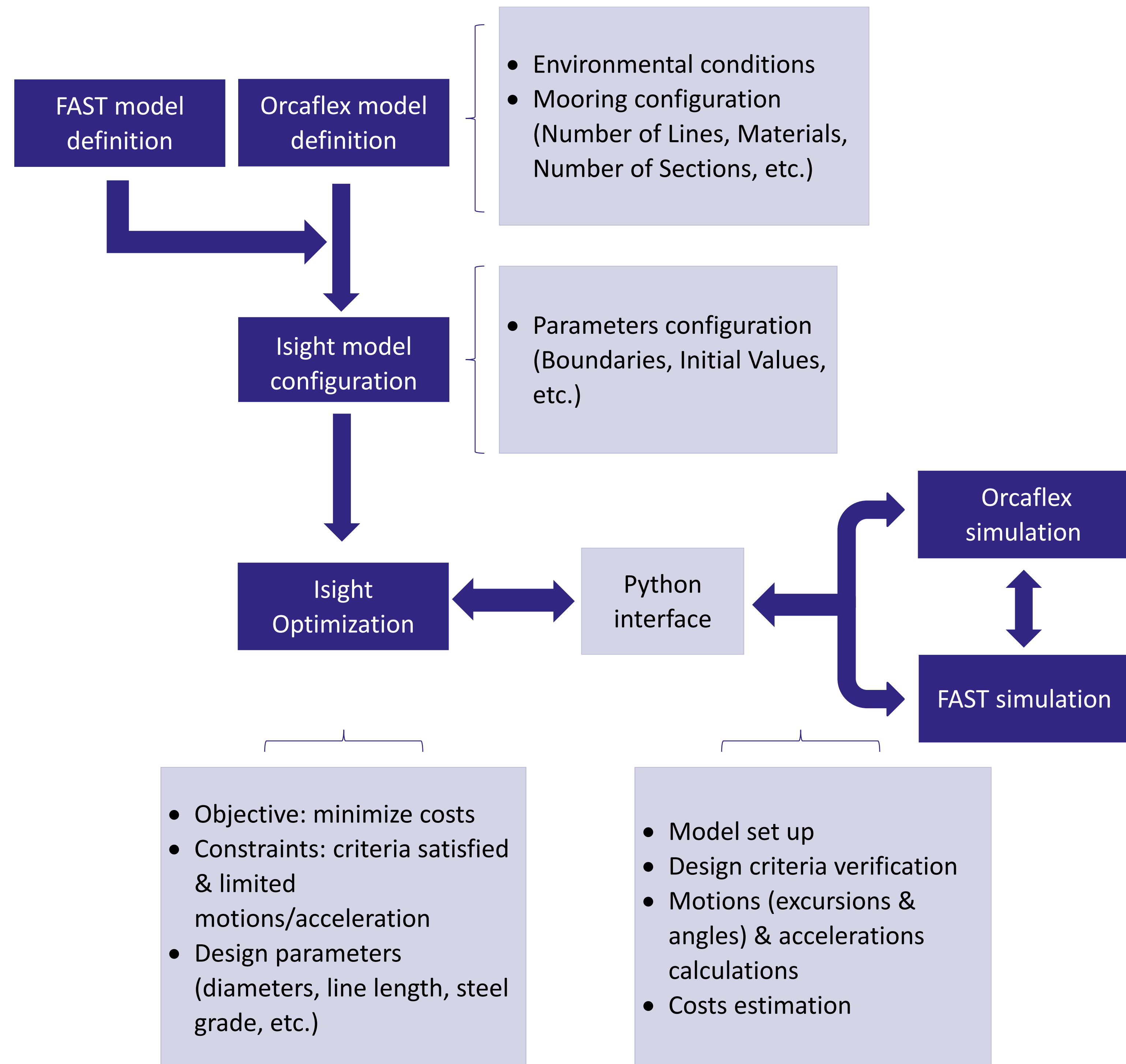
COST DRIVER TO CABLE CONFIGURATION IS PRIMARILY ANCILLARY HARDWARE COSTS

Cable Configuration Design Process

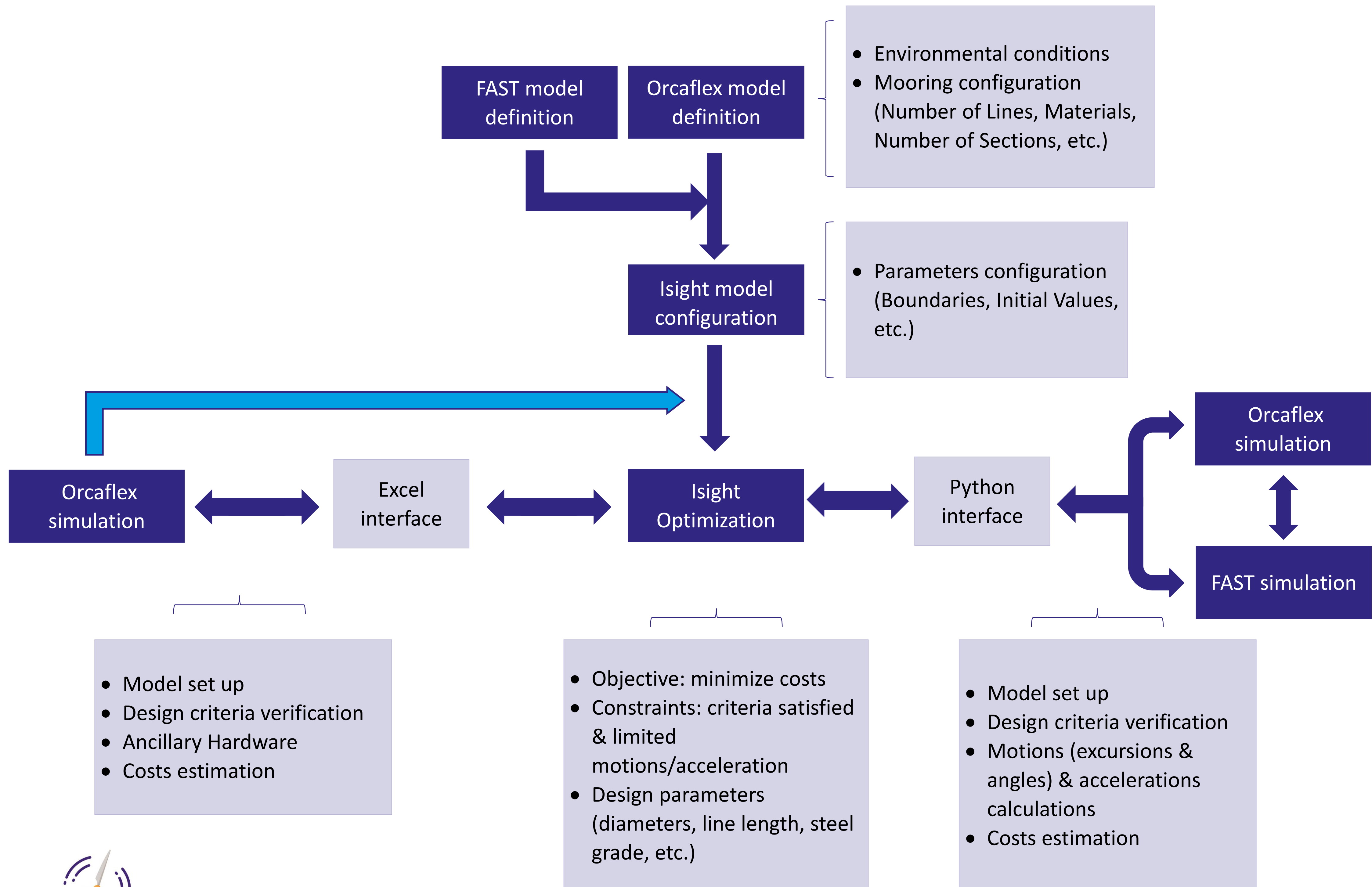
- Static configuration
 - Dynamic length
 - Positioning of buoyancy
 - Tether requirements
- ULS / ALS analysis
- Interference analysis
- Fatigue assessment
- Confirm
 - Cable design
 - Dynamic configuration
 - Ancillary hardware costs



Mooring Design Optimization



Mooring & Cable Design Optimization



Optimization for Commercial Scale FOWF

- Optimisation of mooring and cable to reduce system cost
 - Larger mooring offset will increase cable ancillaries cost
 - Will be influenced by site and project requirements
- Considerations for commercial scale:
 - Economies of scale / standardisation
 - Shared systems e.g. anchoring, connection points
 - Innovations in materials and design philosophies
- And beyond...
 - Larger turbines; deeper waters; bigger challenges
 - Higher voltage dynamic cables
 - Innovative mooring and hardware solutions

Thanks for your attention

