

## Introducing a Decision Tool for Aligning Wind Resource and Metocean Studies

Rémi Gandoin, Jorge Garza  
C2Wind

# How to streamline Wind Resource Assessment and Metocean measurement- and modelling strategies

### STEP 1

Characterize site conditions using (publicly-available) measurement and model datasets.

Characterize surface atmospheric stability using ERA5 Obukhov length and boundary layer height.

Characterize Wind-Sea and Swell climates, as well as currents and water levels

Identify risk flow cases, which may lead to discrepancies between WRA and Metocean studies:

- Stable conditions: large wind speeds at hub height associated to relatively small(er) Wind-Sea waves (than in unstable conditions).
- Coastal gradients: risk of strong mean bias when using coarse reanalysis for driving spectral wave models.

### STEP 2

Design measurement strategies fulfilling both WRA and Metocean objectives.

WRA objectives

Metocean objectives.

Run tender for floating lidar campaign, with optional wave buoy(s) and current profiler(s)

Carry out a cost/benefit analysis and evaluate most valuable bidder.

Most floating lidar systems do not provide reliable sea state measurements (and directional spectra). The cost of an additional, quality wave buoy is small compared to the impact of using faulty/biased floating lidar wave measurements.

For capturing wave extremes (important for design), it often makes sense to deploy an additional wave buoy and measure for more than one year (for the lidar, a one year campaign may be enough).

### STEP 3

Carry out WRA and Metocean modelling studies and combine their outcomes.

Carry out WRA

Carry out hindcast study

Carry out Site Conditions Assessment:

- If the hindcast study does not include hub height time series (for instance: CFSR/CFSv2), then create a hub height time series using extended Monin-Obukhov Similarity Theory as per [C2W24].
- Scale the hindcast study hub height wind speed time series so that the shape of its distribution matches that prescribed by the WRA (for this item, WRA should take precedence over SCA).
- Carry out all NSS and SSS analyses using the hindcast time series