

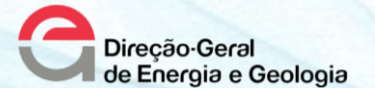
## OEE 2019 knowledge sharing workshop

## Costs, environment and the supply chain

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OEE, Dublin, 30<sup>th</sup> September 2019

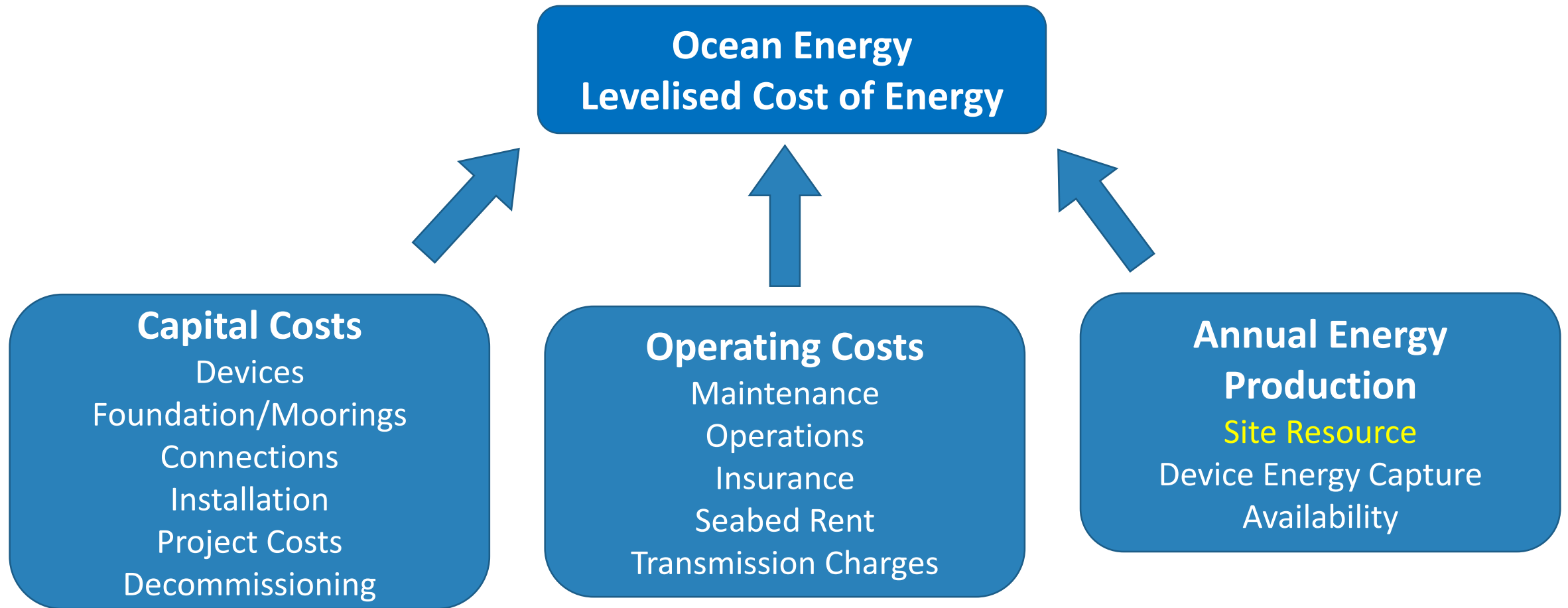


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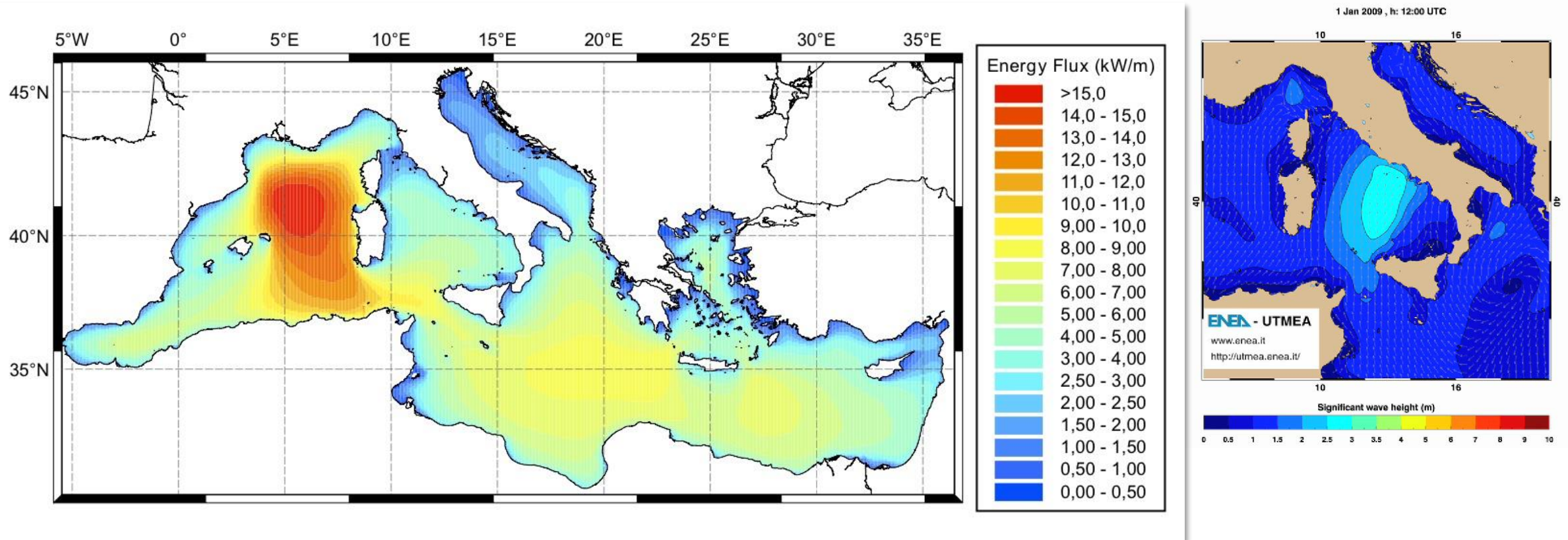
- The SET-Plan declaration of intent for ocean energy has set ambitious targets for wave and tidal energy technologies:
  - **Tidal** technologies are expected to reach a levelized cost of energy (LCOE) of 0.15€/kWh by 2025
  - **Wave** technologies are expected to reach a levelized cost of energy (LCOE) of 0.15 € /kWh by 2030

$$LCOE = \frac{[Capital\ Costs + lifetime * (Annual\ Operating\ Costs)]}{lifetime * [Annual\ Energy\ Production]}$$



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# Ocean Energy Costs in EU: Site Resource

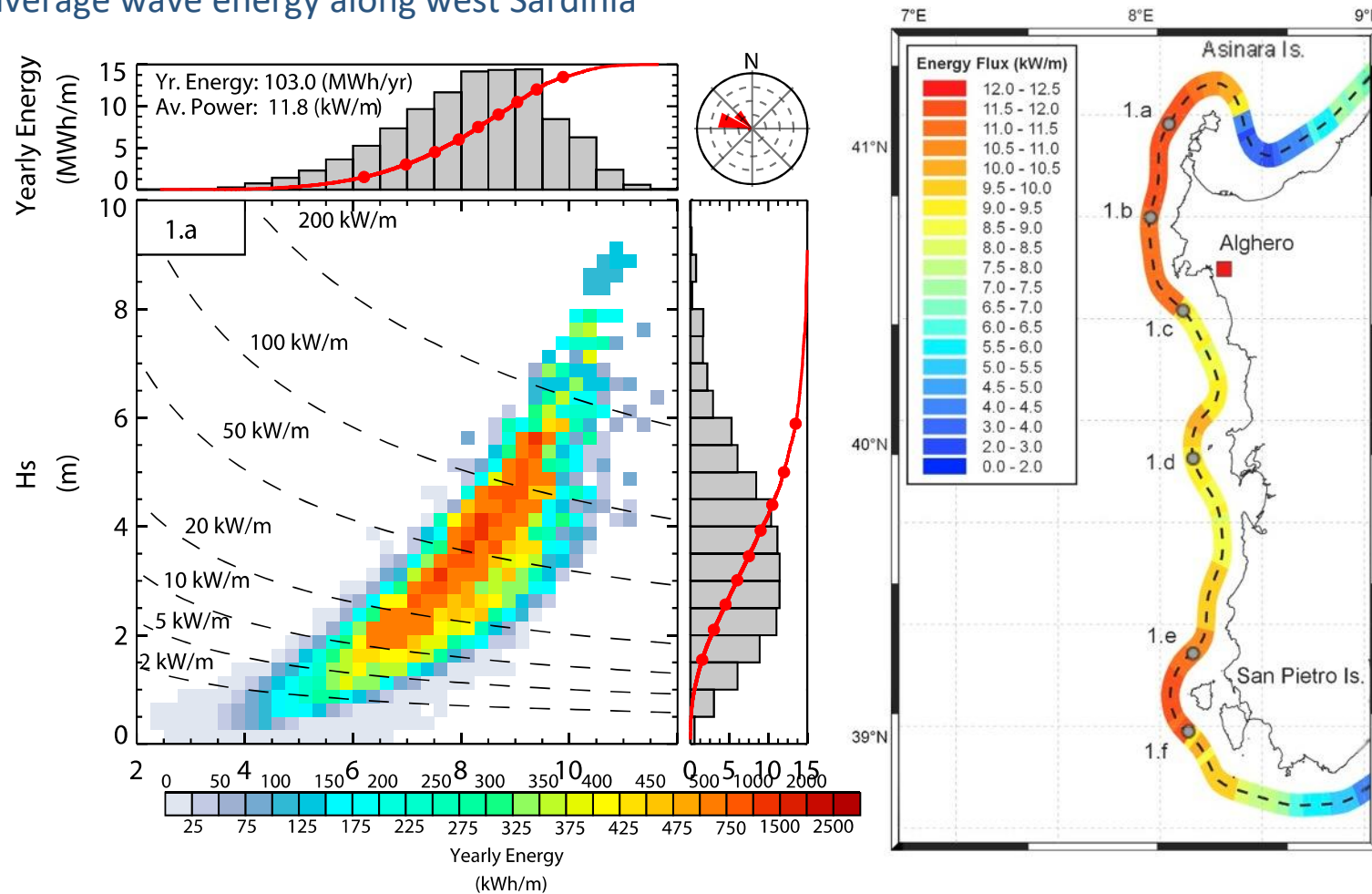


Distribution of average power per unit crest in the Mediterranean between 2001 and 2010.

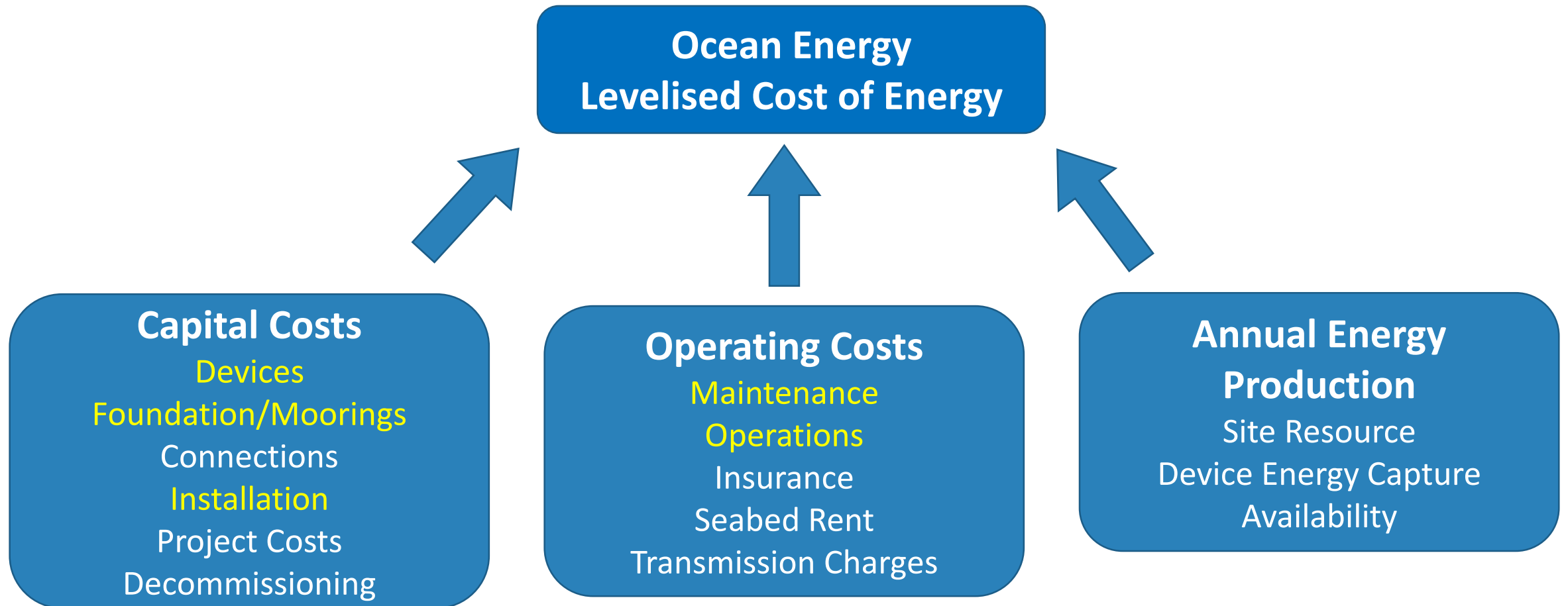
$$J = \frac{\rho g^2}{64\pi} T_e H_s^2$$

# Ocean Energy Costs in EU: Site Resource

## Distribution of yearly average wave energy along west Sardinia



Distribution of wave energy as a function of significant wave period and significant wave height at specific points. Lower left panel shows the average yearly energy associated with sea states identified by  $T_e$  and  $H_s$  couples. Dotted lines mark reference power levels. Upper panel shows the energy distribution as a function of  $T_e$  only; right panel as a function of  $H_s$  only. Red lines in the upper and right panels are the cumulative energy as a percentage of the total. Red dots on the cumulative lines mark each 10th percentile. Rose plot in the upper right panel shows energy distribution over wave incoming direction. Each circle represents 20% fractions of the total energy.



$$LCOE = \frac{[Capital\ Costs + lifetime * (Annual\ Operating\ Costs)]}{lifetime * [Annual\ Energy\ Production]}$$

# Ocean Energy Costs in EU: potential reduction



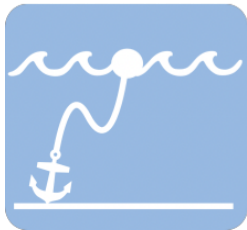
Device cost accounts approximately for **53%** of lifetime costs for wave array and **23%** for tidal array



Installation makes up **18%** of lifetime costs for a wave array and **27%** of lifetime costs for a tidal array.



Operating and maintenance costs make up **17%** of lifetime costs for a wave array and **19%** of lifetime costs for a tidal array.



The foundation or moorings make up **6%** of typical lifetime costs for an offshore wave array and **14%** of lifetime costs for a bottom mounted tidal array. Costs for floating or neutrally buoyant tidal devices could be lower.

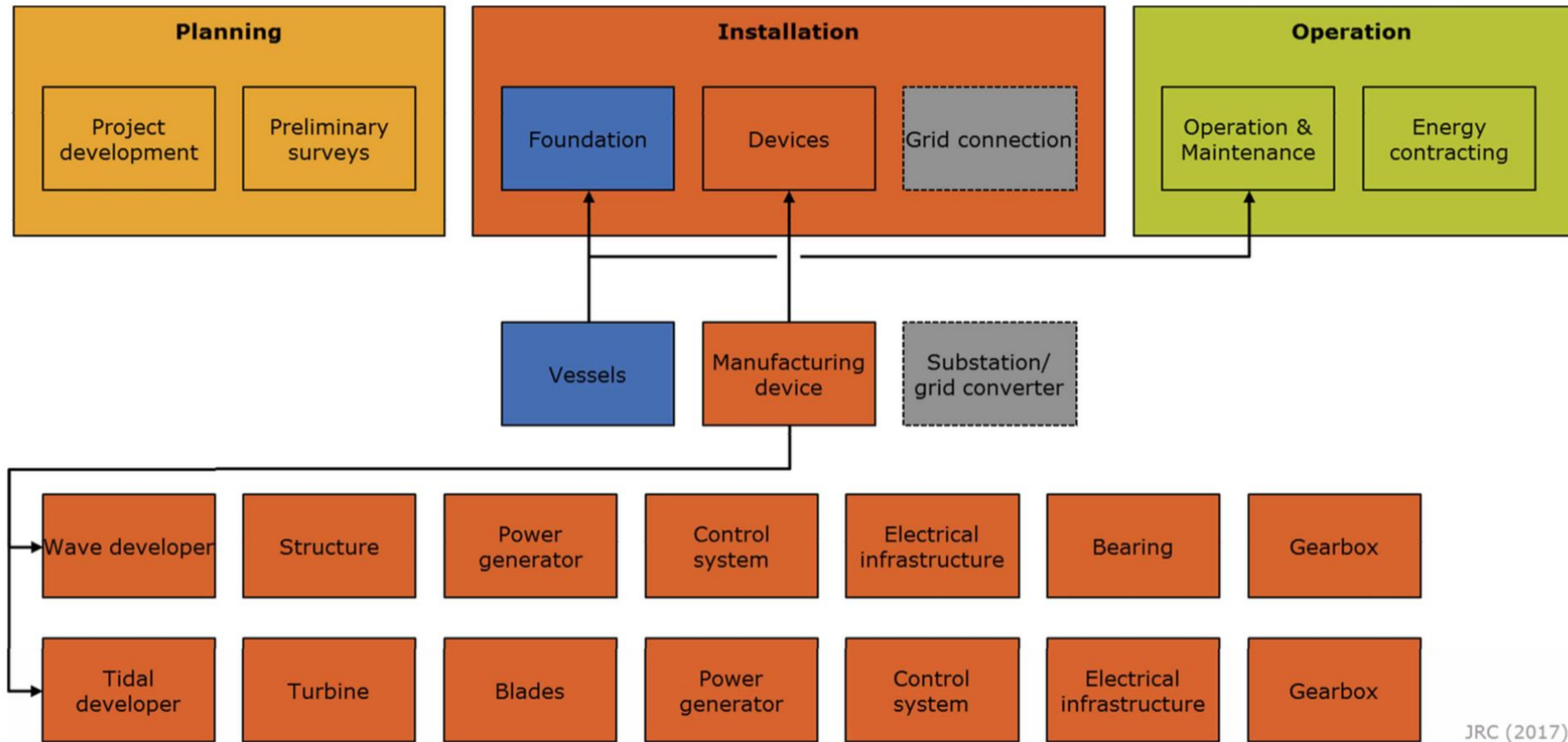


An EU-wide supply chain can substantially contribute to cost reduction



# Ocean Energy Costs in EU: potential reduction

## Expected consolidated ocean energy supply chain



Source: JRC

An EU-wide supply chain can substantially contribute to cost reduction





- Consenting and licensing

- Among key bottlenecks that the ocean energy sector faces moving forwards is the concern regarding unknown environmental impacts slowing down consenting (permitting) and licensing of projects.
- Regulatory requirements are currently high and may not always target the most useful information

- Environmental risks

- Environmental risks for deployment and operation of single devices appear to be very low. Very small arrays of devices may also present low risks
- However, the remaining uncertainties associated with commercial arrays will require investigation as the larger arrays come online

- As the MRE industry moves toward deployment and operation of larger arrays at the commercial scale, assuring that this emerging low-carbon energy source can expand without causing unacceptable harm to the marine environment will require:
  - sharing of all the collected information;
  - application of data collected from one location to another;
  - additional monitoring and validation of numerical models;
  - development of strategic research programs at regional, national, and international levels;



- **Cost Reduction**

- Is the EU targeted LCOE (15 €/kWh by 2025/2030) sustainable for tidal/wave energy developers?

- **Supply Chain**

- Cohesive investment areas could contribute to reduce costs along the supply chain enabling large scale deployments: do dedicated districts already exist in your Country/region)?
- How would you classify in your Country/Region the ocean energy (wave, tidal) supply chain?

- **Harmonizing Competition & Cooperation → Coopetition**

- How to stimulate developers, private investors, and relevant players (large enterprises) to divulge information on costs, environmental impact, business network?

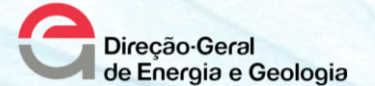
- **Environmental Impact**

- Is there any consistent environmental impact assessment at Government level?

**Thank you for your attention!**

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