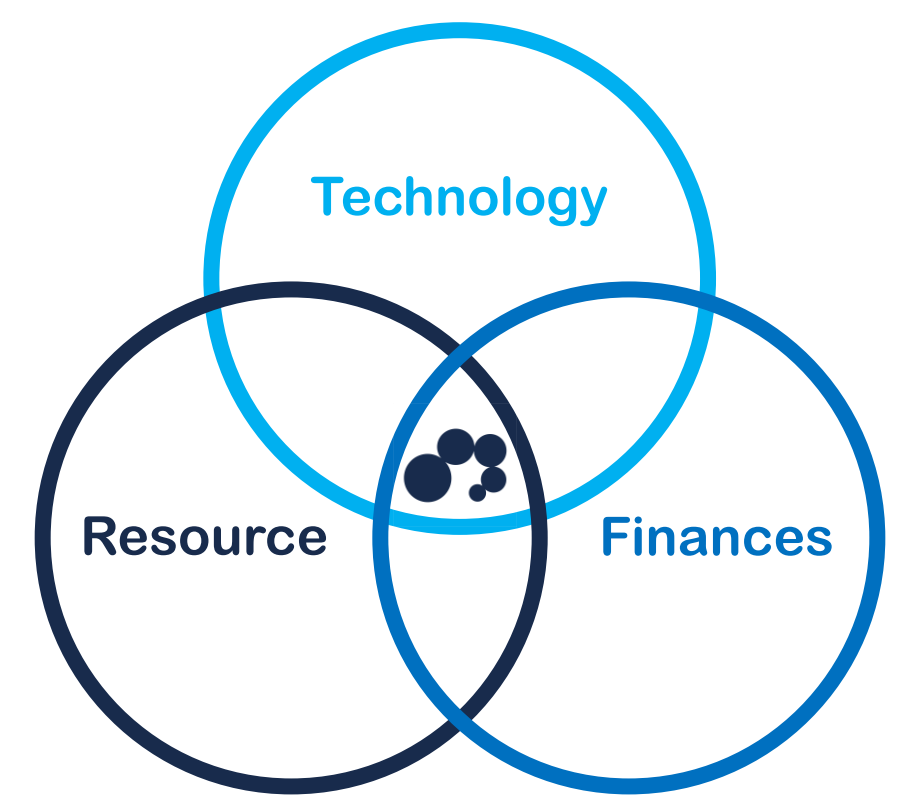
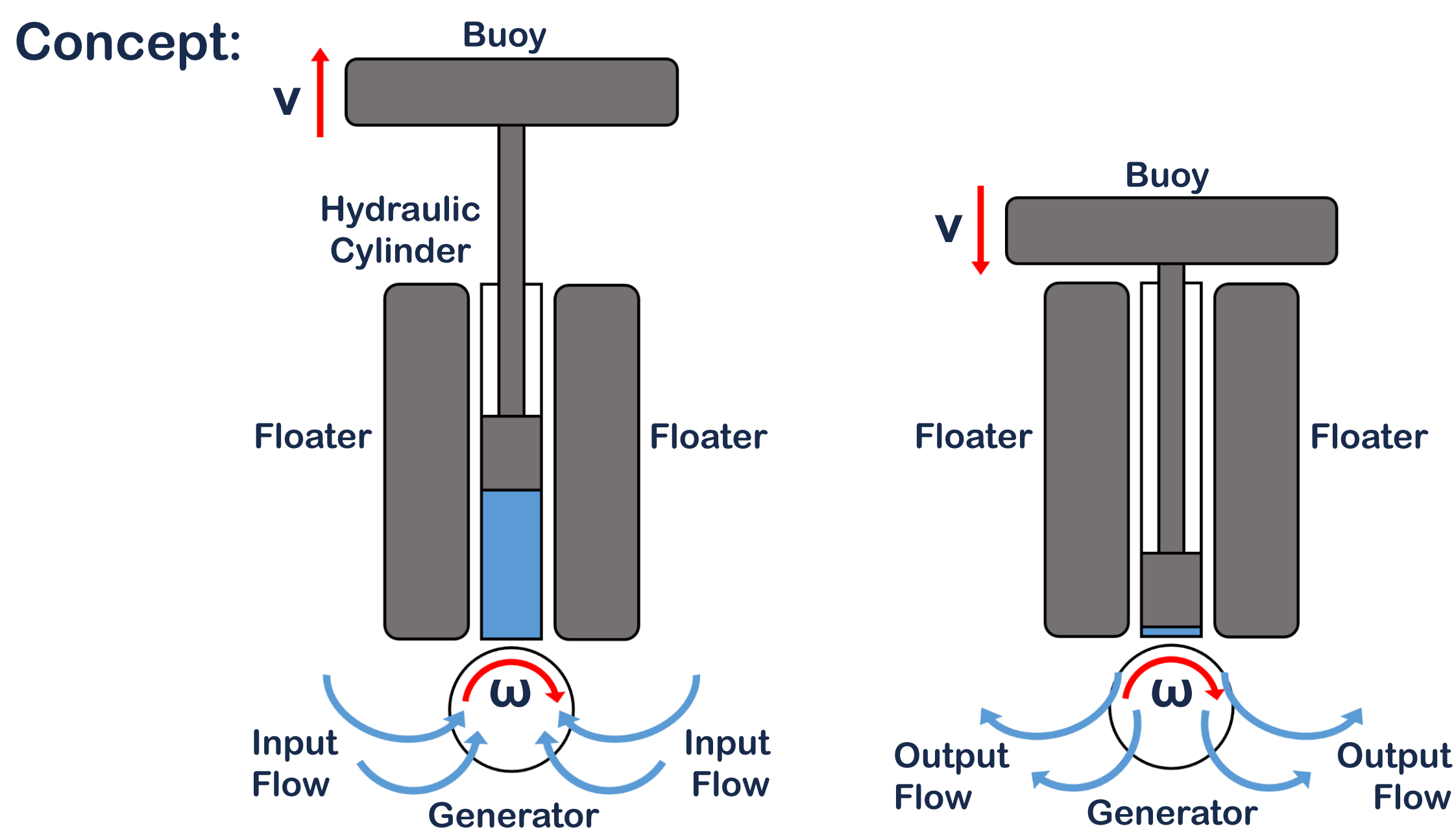


Introduction

The world population has increased the energy demand and the electricity generation still depends on fossil fuels in some areas. Close to the coasts, waves have a 2.900 TWh/year theoretical potential energy. Rotary or linear electromagnetic generators need high speed to create electricity. Gears, gear racks, cams, rods, pulleys or oils are used in actual technologies for power transmission and/or speed increase, requiring more maintenance labor and increasing failure and extra costs possibility. Current wave energy projects use complex technologies, special parts, and new manufacturing processes that are not available in some regions, isolated communities, or developing countries [1]. Neowave is looking for all principles of balance for the development of an applicable wave energy technology [2].



Methods



LCoE simplified formula [3]:

$$LCoE = \frac{FR \times IC + LRC + O\&M}{AEP}$$

Where:

- FR: Financing Rate, %
- IC: Initial Capital (CapEx), \$
- LRC: Annual Levelized Replacement Cost, \$
- O&M: Annual Oper. and Maint. costs (OpEx), \$
- AEP: Annual Energy Production, MWh

Manufacturing processes and materials:

- Cutting
- Turning
- Welding
- Routing
- Drilling
- 3D printing
- PVC, HDPE, PVA, PS
- Carbon steel, inox steel, chrome steel, galvanised steel, aluminum
- Tempered glass
- Plywood
- Adhesives and lubricants
- Sealants and paints: Rubber, butyl, PU
- Commercial parts

Results

Functional prototype:



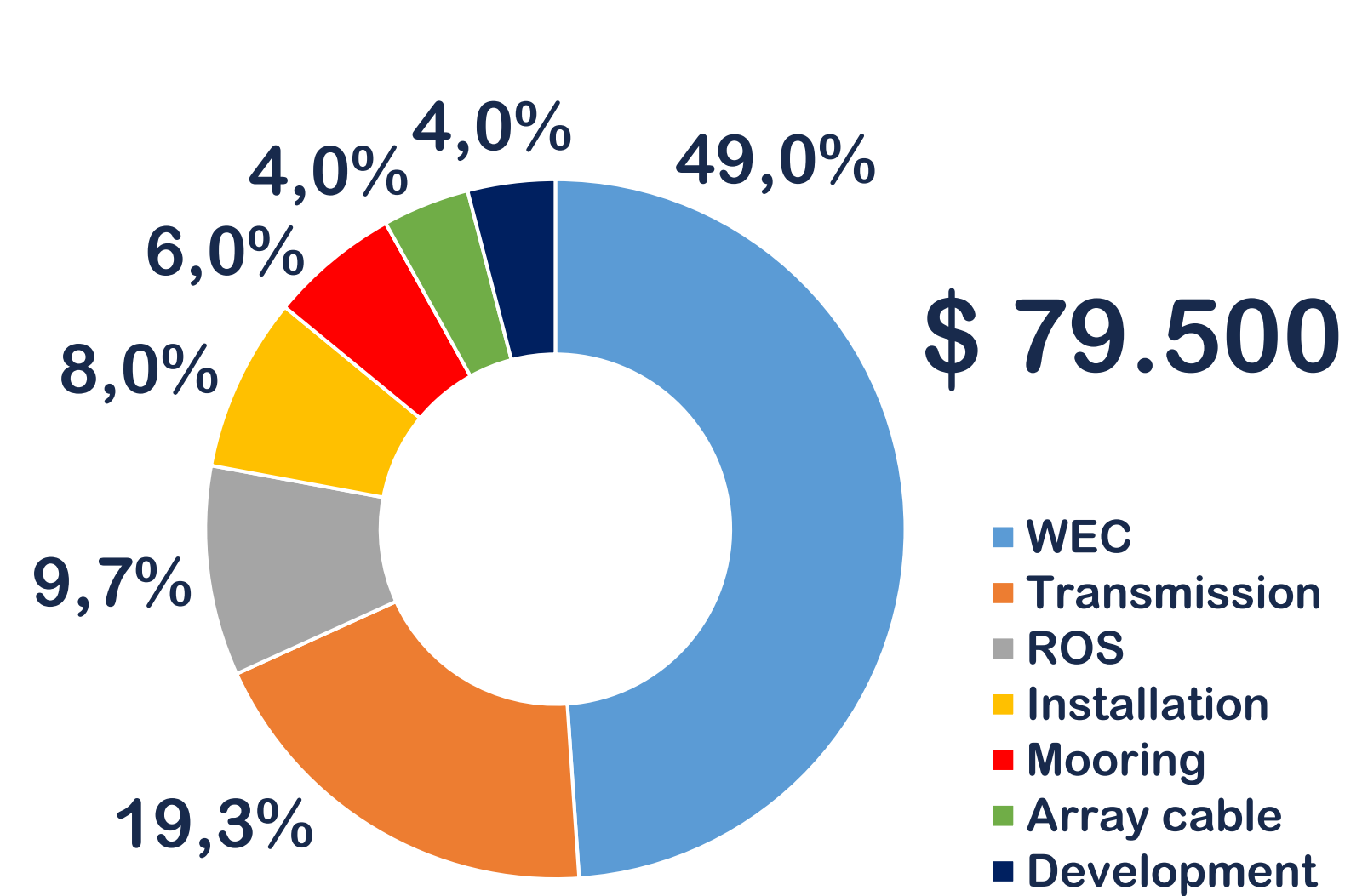
CAD design and technical aspects:



- Simple, scalable, and stackable design.
- Four 1:2 scale units in one 40'HQ container, 35 MWh per month and better logistics.
- Few, basic, standard, industrialized and commercial components.
- Special parts' fabrication by suppliers with traditional manufacturing technologies.
- No gears, gear racks, cams, rods, pulleys, bands, chains or oils for power transmission.
- Remotely operated systems for control (ROCS), and maintenance (ROMS), designed and with patent pending processes.

Scale:	Power:	Efficiency:	Diameter:	Cap. Factor:	Height:	Weight:	Life time:
1:2	32 kW	62 %	6 m	40 – 60 %	9 m	8 ton	30 yr.

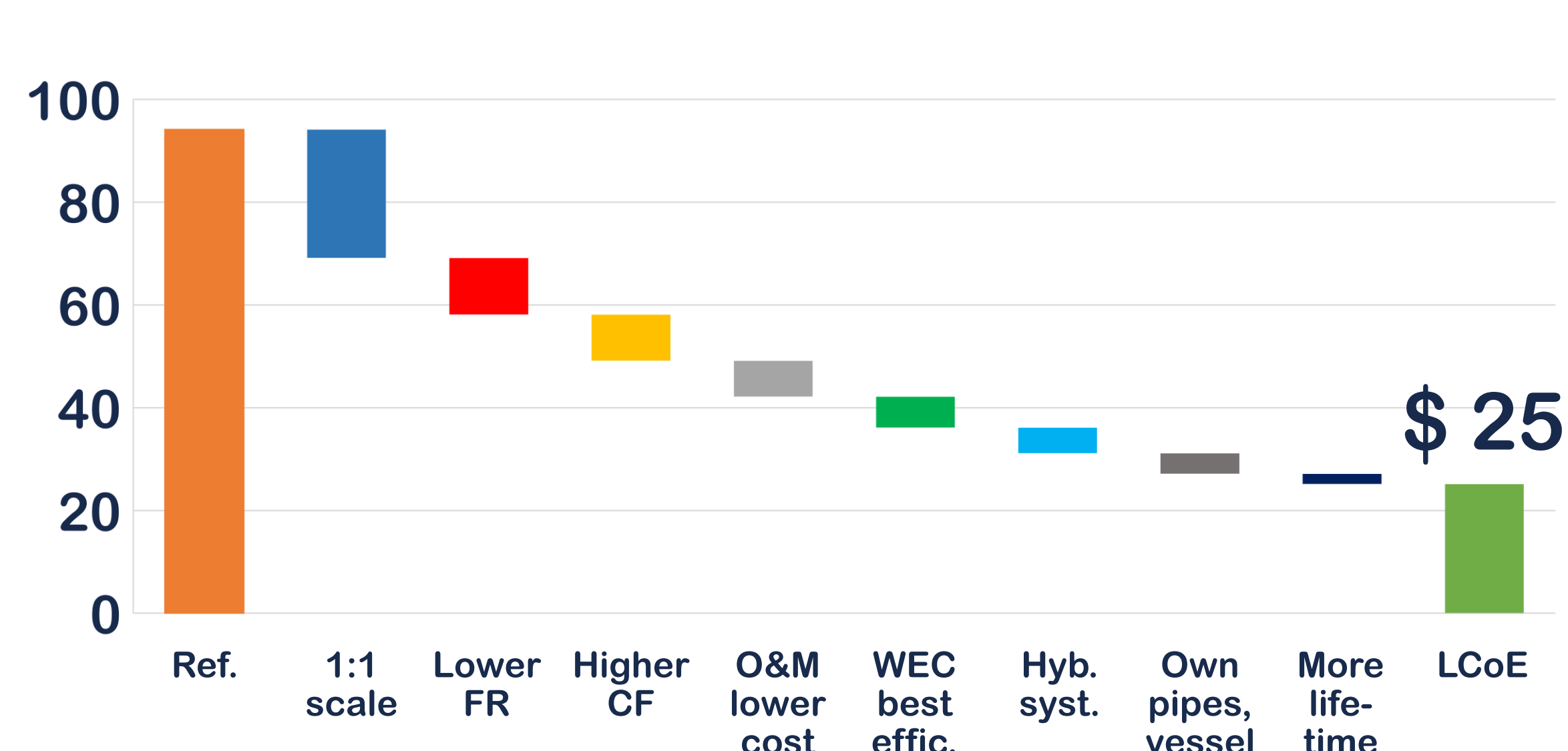
CapEx composition, \$/unit:



First year LCoE, \$/MWh



Potential reductions, \$/MWh:



Finances:

- Profit margin: 20 %
- Reference: 205 \$/MWh
- ROI, BEP @ 1:2: 15 %, 6 yr.
- ROI, BEP @ 1:1: 20 %, 5 yr.

Discussion and Conclusion

- Neowave is a WEC, point absorber type, based on fluid dynamics and energy conservation principles.
- A full-scale design would have a 300 kW capacity potential for a 6 m high and 10 s period waves.
- A remotely operated maintenance system (ROMS) was designed to reduce operation costs, fewer visits to the installation location, and for extending its useful life. A remotely operated control system (ROCS) was designed to device's adaptation to energy density changes, harmonic movement with the waves, and turn-off in storms.
- The proof of concept was validated with a functional 1:30 scale prototype, getting a TRL 3.
- Financial analysis shows profitability and potential reductions for its LCoE.

References

- [1] IRENA, "Innovation Outlook: Ocean Energy Technologies" Dec. 2020. [Online] Available: <https://www.irena.org/publications/2020/Dec/Innovation-Outlook-Ocean-Energy-Technologies>
- [2] G. Lavidas, "Selection index for Wave Energy Deployments (SIWED): A near-deterministic index for wave energy converters" Journal of Energy, vol. 196, 2020.
- [3] NREL, "Simple Levelized Cost of Energy (LCOE)" Jun. 2010. [Online] Available: <https://www.nrel.gov/analysis/tech-lcoe-documentation.html>

Special thanks to:



Inspired by the breathing dynamics... Identified with jellyfish.

Thanks for your attention! Contact us:

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