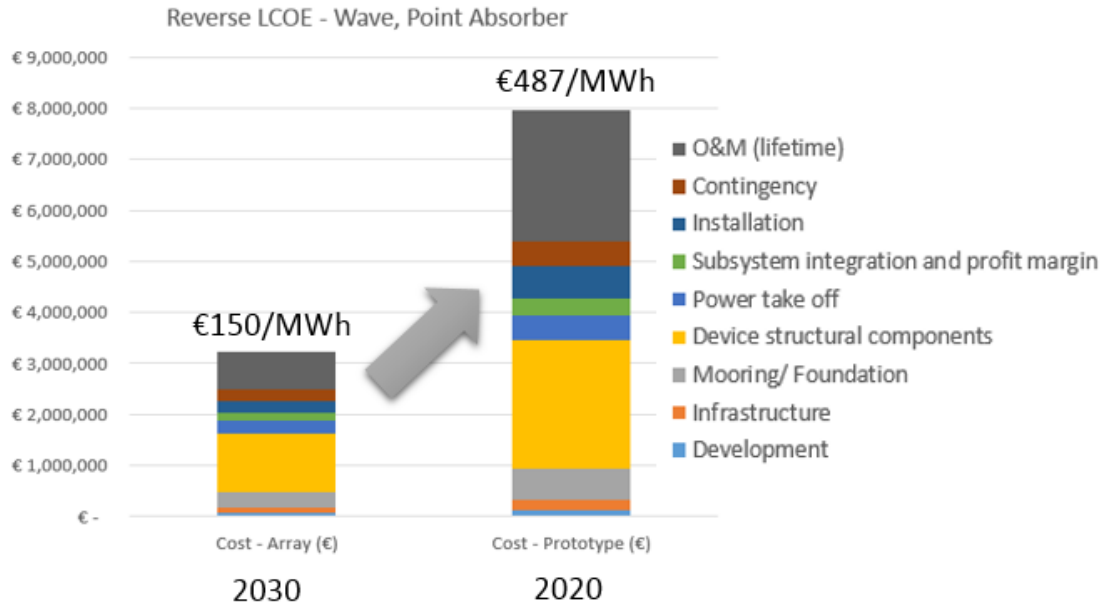
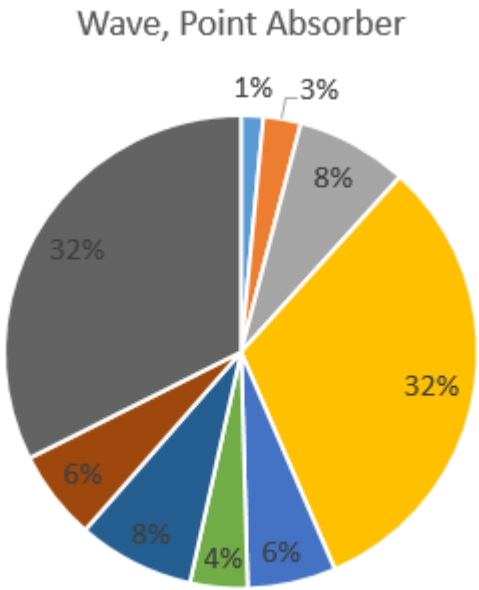
Technology Innovation – Aims & Objectives

- ‘Reverse LCOE’ methodology to identify the **technology innovation** required to achieve the SET Plan targets
- Examines and presents the **implications of the analysis** to inform and design future funding calls





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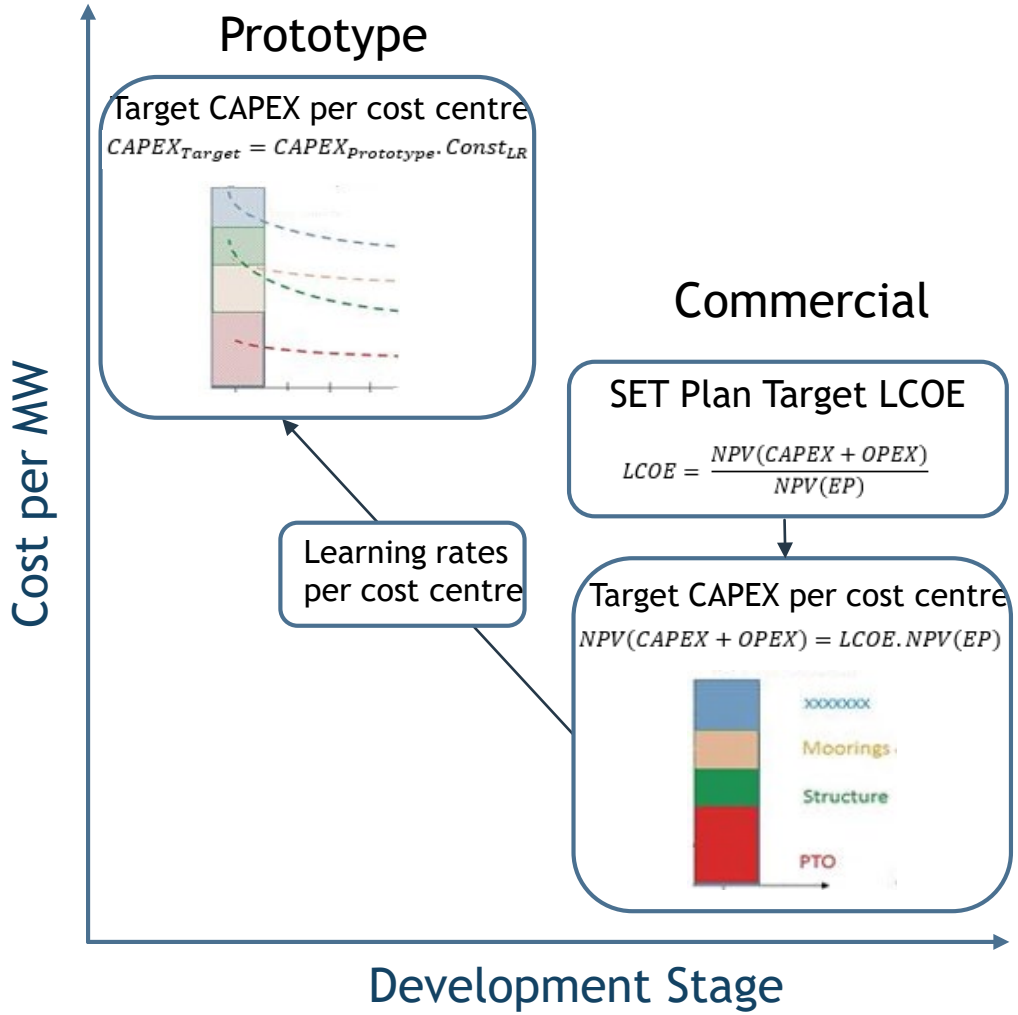
Reverse LCOE methodology



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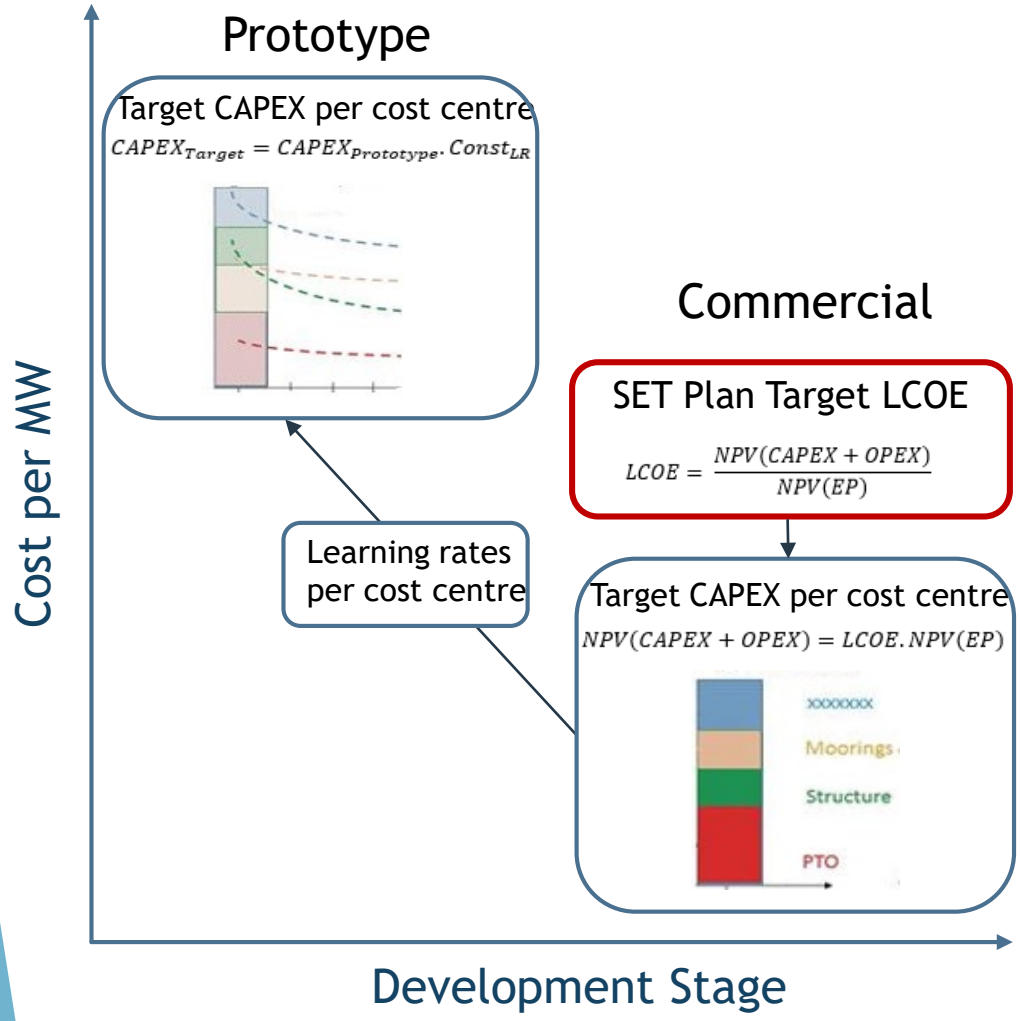
RLCOE Stage 1: future cost targets



SET Plan targets

Technology	LCOE (2030)
Offshore wind (floating)	€90/MWh
Tidal Stream	€100/MWh
Wave	€150/MWh

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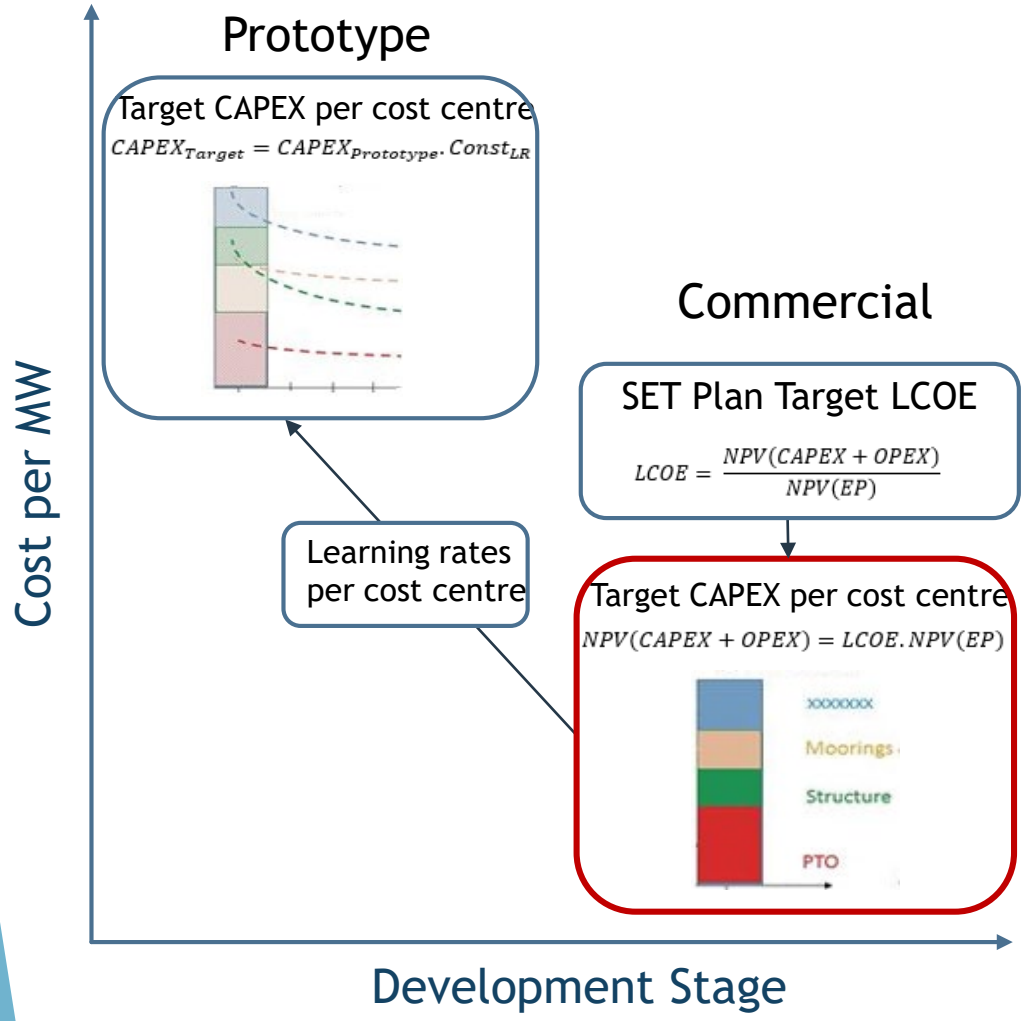
RLCOE Stage 2: target cost centre breakdowns



Assumptions:

- CAPEX breakdown
- CAPEX:OPEX ratio
- Energy production
- Discount factor

Sandia National Laboratories

European Commission
Joint Research Centre

OES OCEAN ENERGY SYSTEMS

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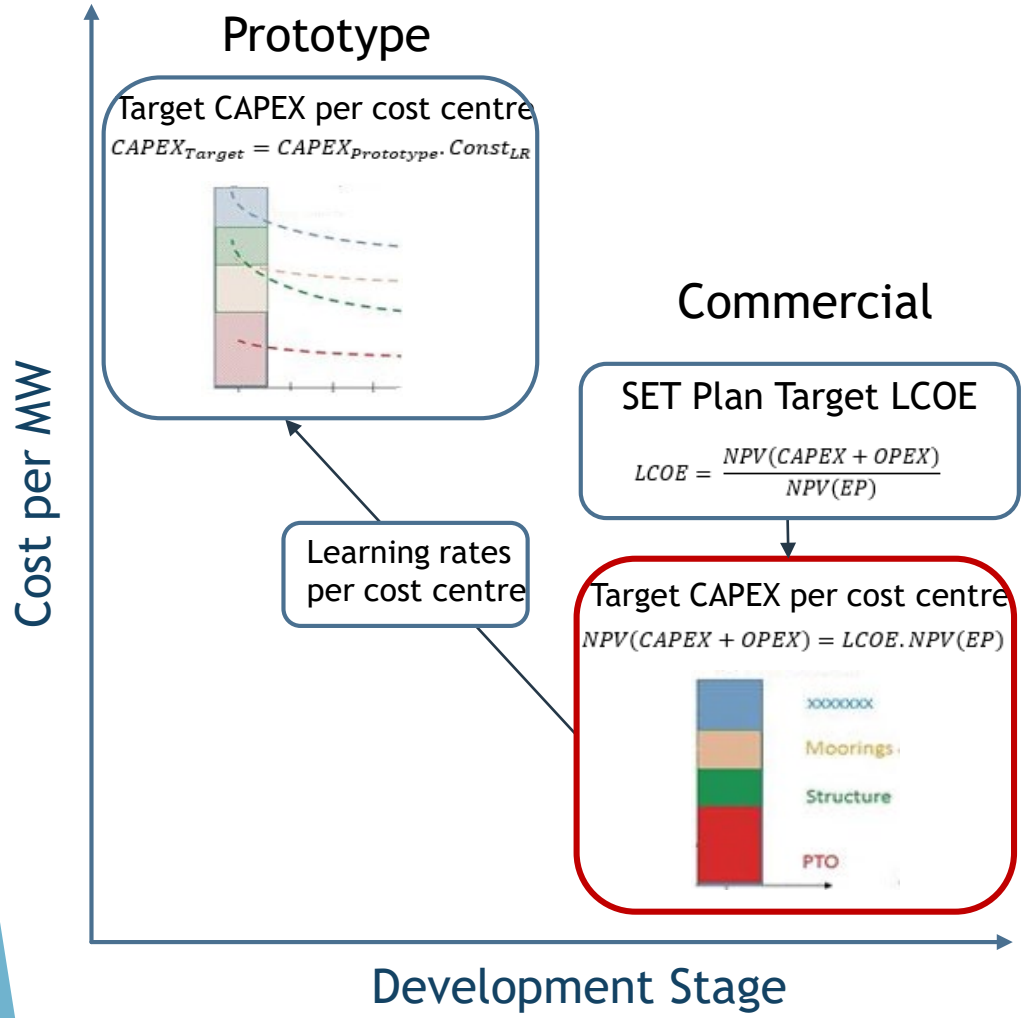
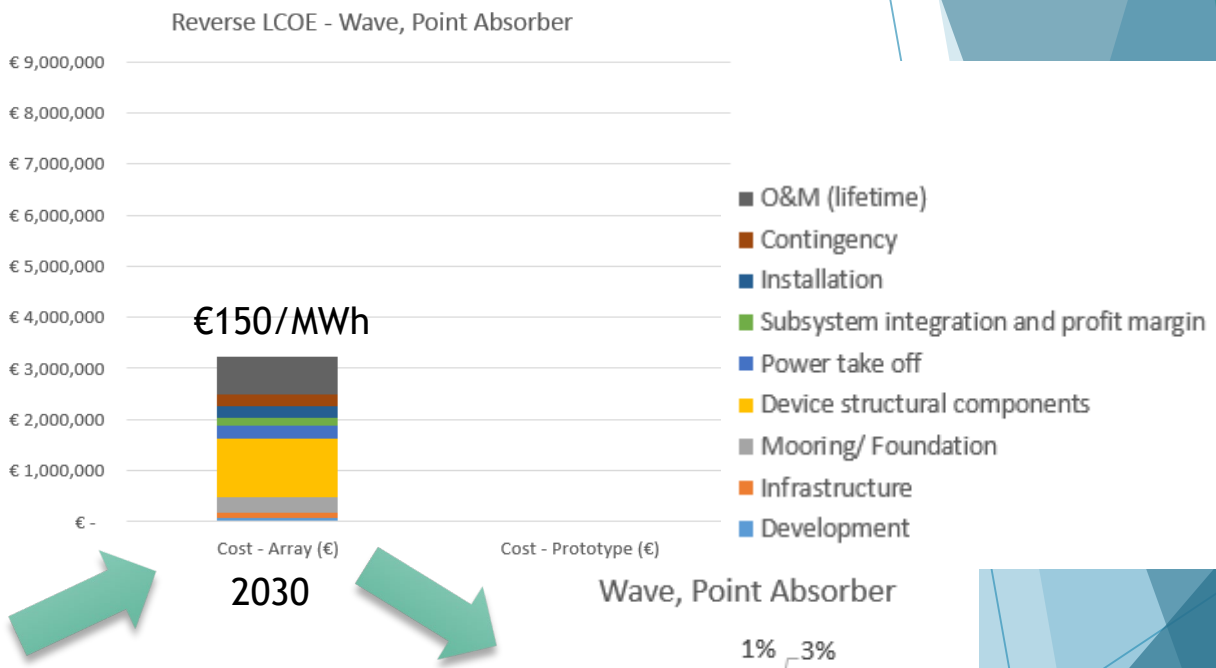
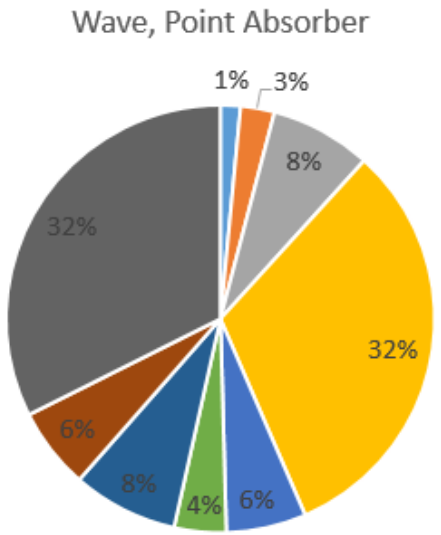
RLCOE Stage 2: estimate cost breakdowns







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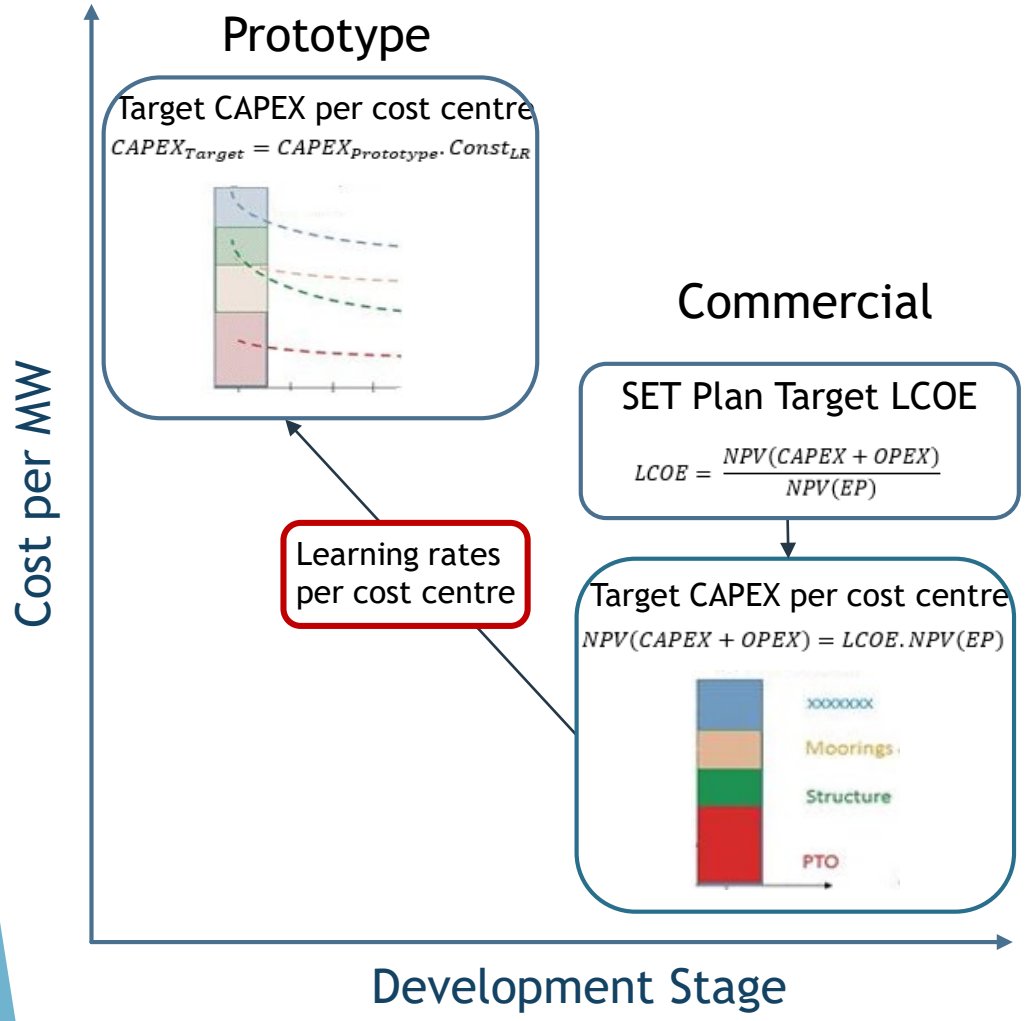
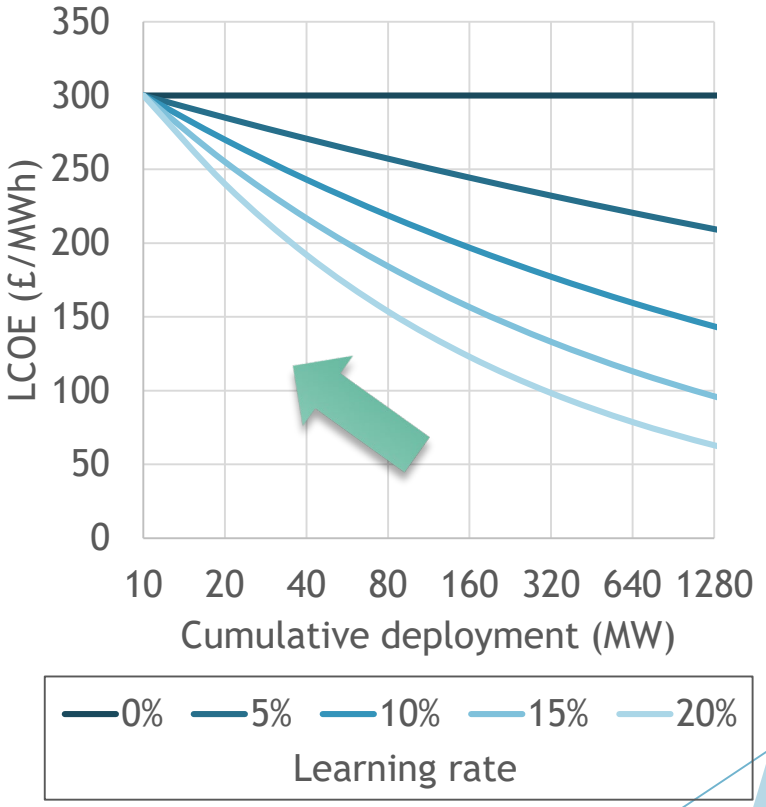
RLCOE Stage 3: cost reduction through learning





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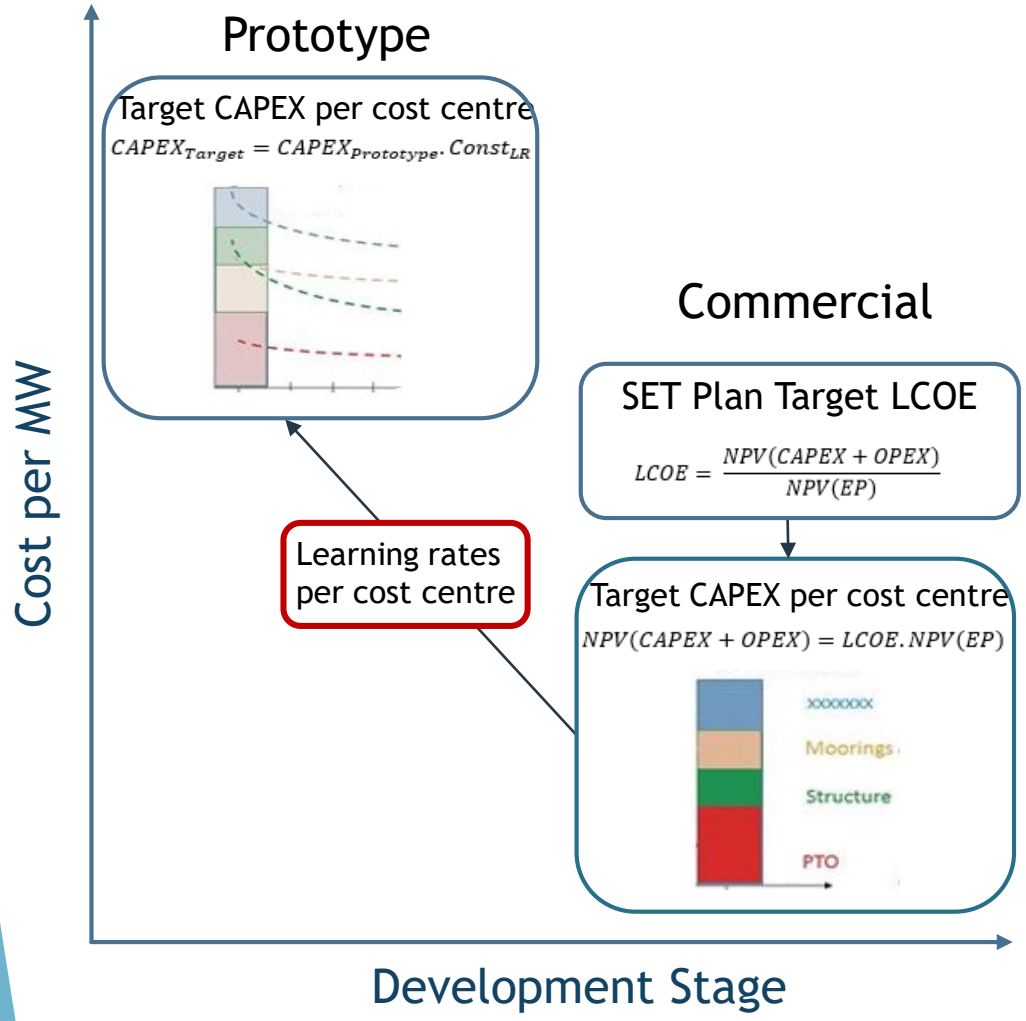
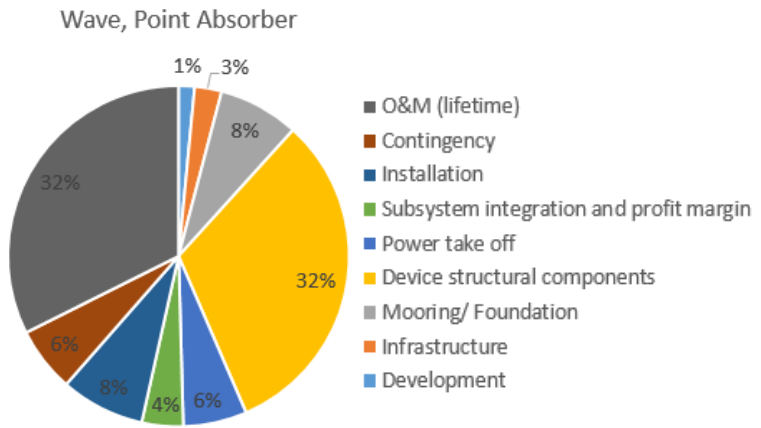
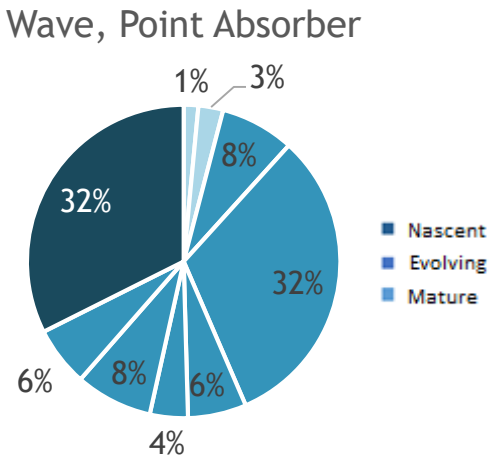
RLCOE Stage 3: cost reduction through learning



Nascent	Evolving	Mature
Highest Learning Rate (15%)	Intermediate Learning Rate (10%)	Lowest Learning Rate (5%)
Least developed - innovative technology or application of existing technology	Some experience - learning applied but still in R&D stages	Fully developed - applied in other sectors and commercially sustainable





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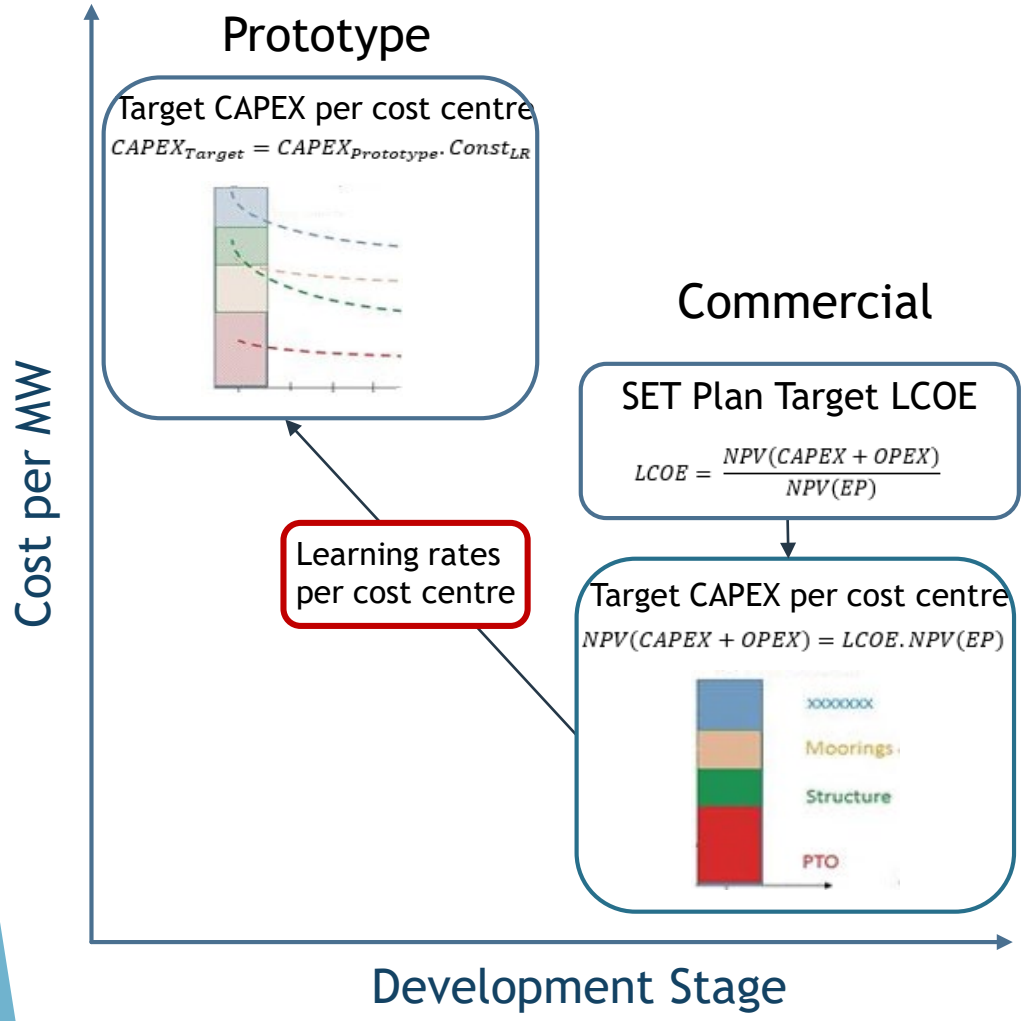
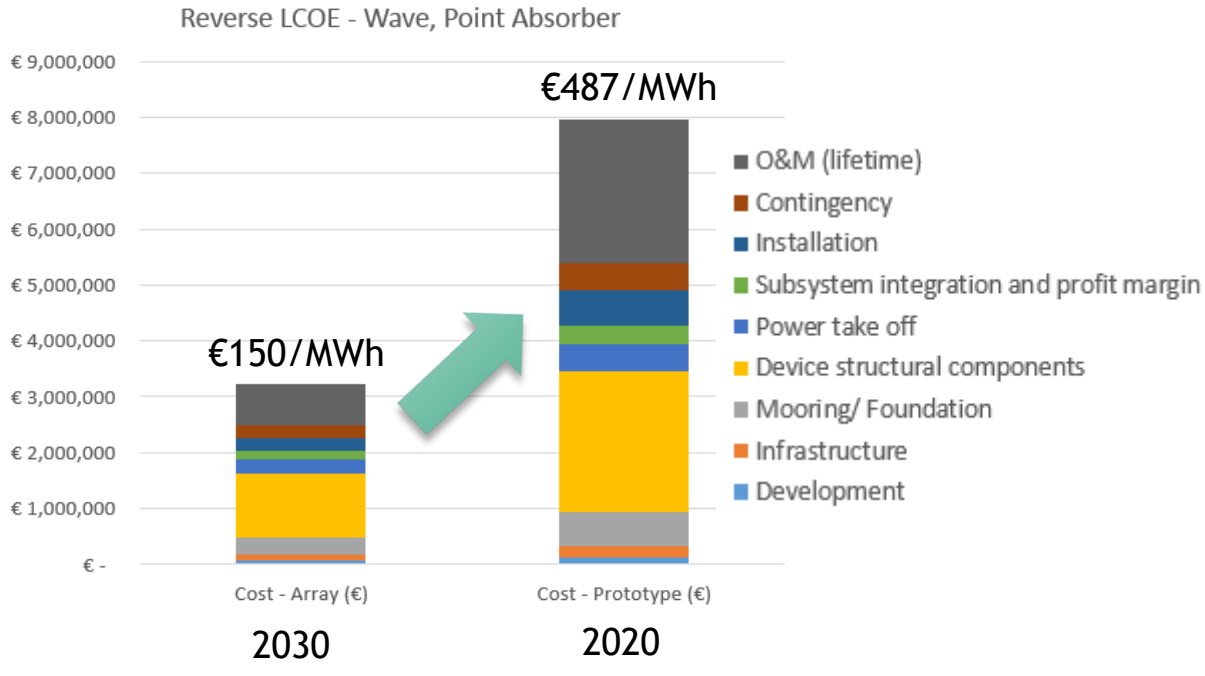
RLCOE Stage 4: calculate prototype target CAPEX





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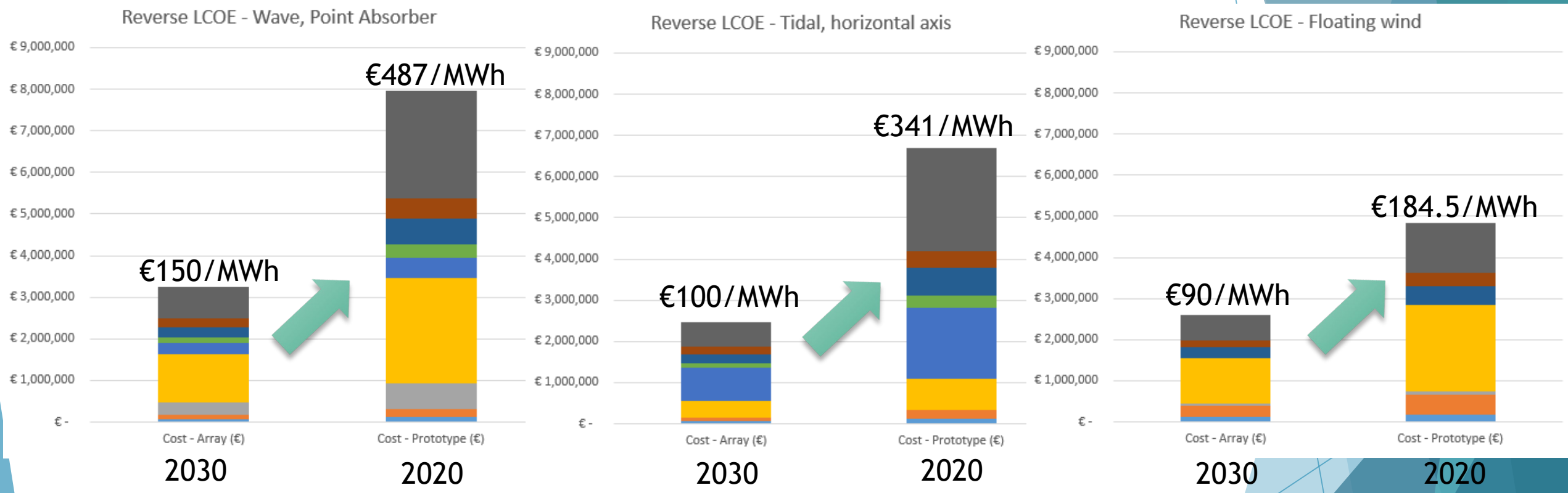
RLCOE outputs – wave, tidal, floating wind



Comparison with current cost estimations

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	Percentage difference with BVGA cost		
Cost centre	Wave	Tidal	Floating wind
Development (k€/MW)	-60%	-51%	-12%
Infrastructure (k€/MW)	-42%	-27%	36%
Mooring/foundation (k€/MW)	-47%	-20%	-24%
Device structural components (k€/MW)	-33%		
Power take-off (k€/MW)		0.30%	
Subsystem integration (k€/MW)			
Installation (k€/MW)	-37%	40%	29%
Contingency (k€/MW)	-42%	-5%	-13%
Total CAPEX (k€/MW)	-41%	-8%	-12%
O&M (k€/MW/yr)	-14%	25%	28%

Reference: BGV Associates, Ocean Power Innovation Network value chain study: Summary report, November 2019

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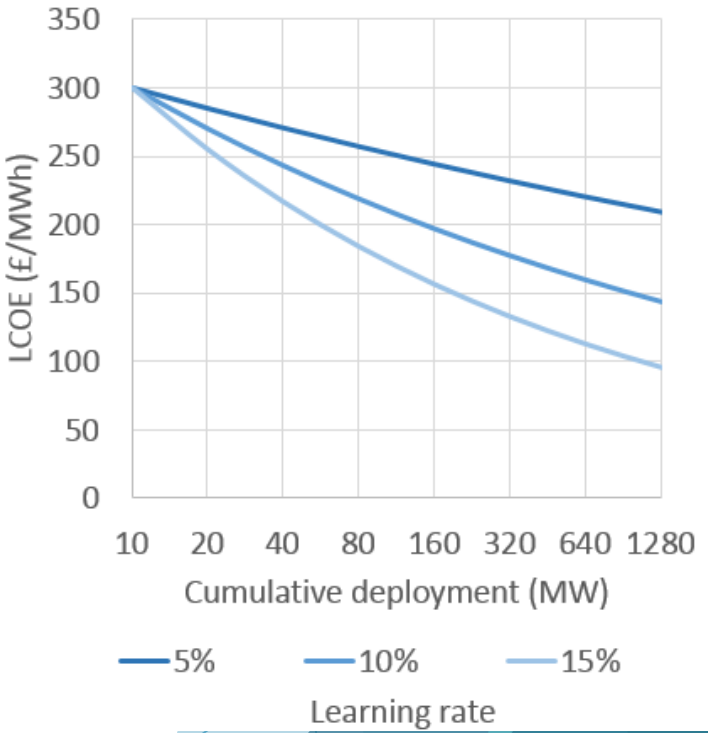
Comparison – standard innovation

	BVGA cost falls within prototype range?		
Cost centre	**Wave**	**Tidal**	**Floating wind**
Development (k€/MW)	IR	IR	IR
Infrastructure (k€/MW)	IR	IR	IR
Mooring/foundation (k€/MW)	IR	IR	IR
Device structural components (k€/MW)	IR	IR	IR
Power take-off (k€/MW)	IR	IR	IR
Subsystem integration (k€/MW)	IR	IR	IR
Installation (k€/MW)	IR	OT	OT
Contingency (k€/MW)	IR	IR	OT
Total CAPEX (k€/MW)	IR	IR	OT
O&M (k€/MW/yr)	IR	OT	OT

IR = Innovation required OT = On track

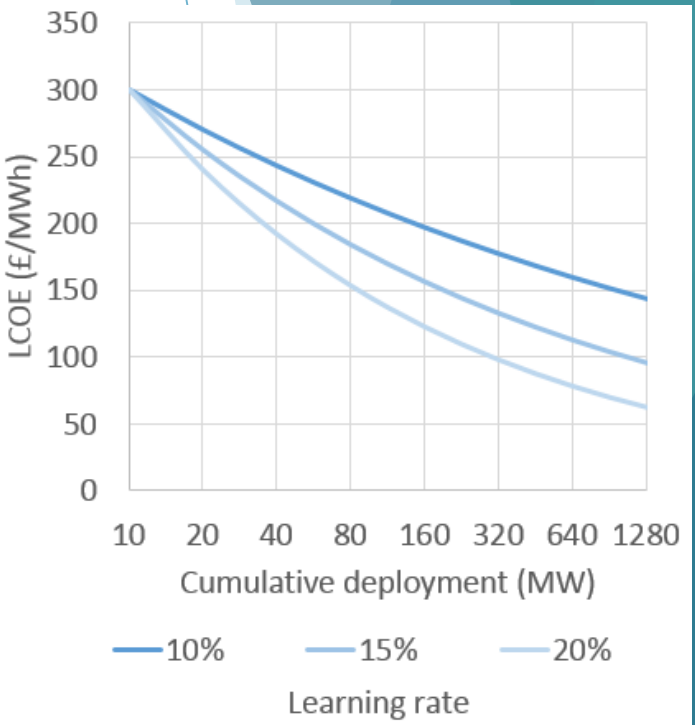


Reference: BGV Associates, Ocean Power Innovation Network value chain study: Summary report, November 2019

Comparison – advanced innovation

	BVGA cost falls within prototype range?		
Cost centre	**Wave**	**Tidal**	**Floating wind**
Development (k€/MW)	IR	IR	OT
Infrastructure (k€/MW)	IR	OT	OT
Mooring/foundation (k€/MW)	IR	OT	OT
Device structural components (k€/MW)	OT		
Power take-off (k€/MW)		OT	
Subsystem integration (k€/MW)			
Installation (k€/MW)	IR	OT	OT
Contingency (k€/MW)	IR	OT	OT
Total CAPEX (k€/MW)	IR	OT	OT
O&M (k€/MW/yr)	OT	OT	OT

IR = Innovation required OT = On track



Reference: BGV Associates, Ocean Power Innovation Network value chain study: Summary report, November 2019

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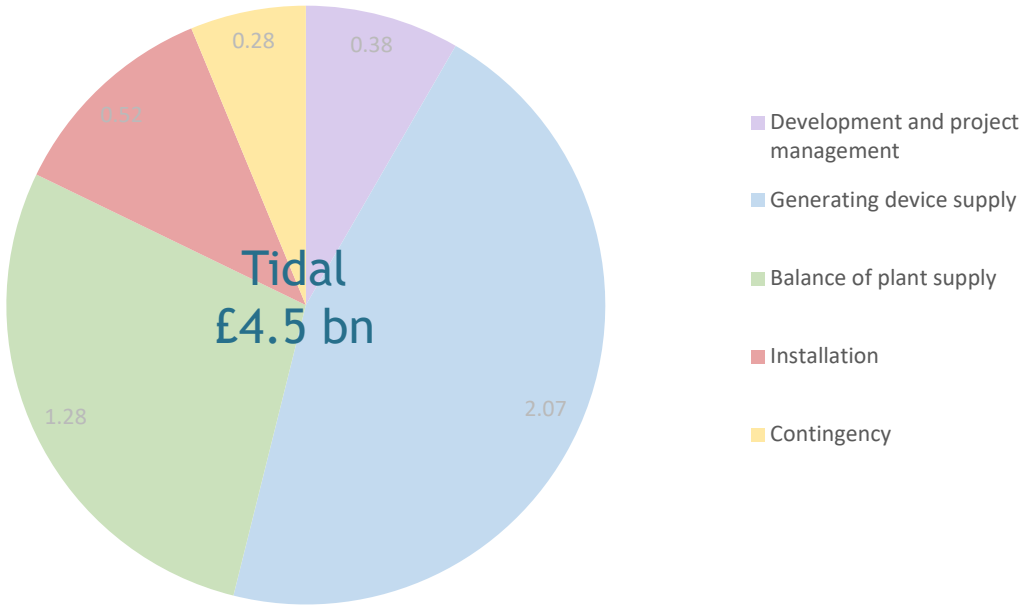
GVA in the supply chain

GVA per cost centre
Tidal deployment in the UK
Low leakage, discounted, low nuclear scenario
(£ billion)



GVA per cost centre
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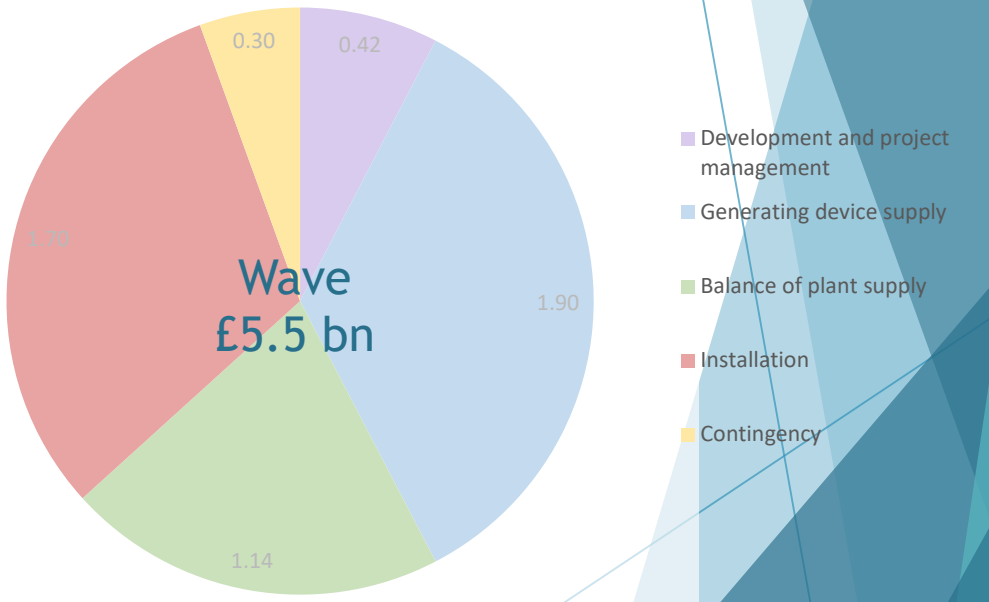

Cost breakdown source: BVG Associates, Ocean Power Innovation Networks Value Chain Study (Summary Report), 2019
Discounted for inflation at 3.5% (UK Treasury Green Book, 2020)

Conclusions

- Meeting SET plan cost targets results in 19 GW marine deployment, up to £40bn GVA from wave and tidal stream

- Innovation and development requirements to reach these targets are different for wave, tidal stream and floating wind
- The development of different offshore renewable components and services result in different GVA benefits
- Future funding calls and programmes should be designed with this in mind to realise these benefits

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Thanks for your attention

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