

# Modelling the public investment for renewable energy cost reduction

## PhD context – Research objectives

1. How policy affects innovation in the energy sector?
2. The potential of novel conversion technologies to enable step change innovations in the Wave Energy sector
3. Policy recommendations to develop step change innovations in the wave energy sector

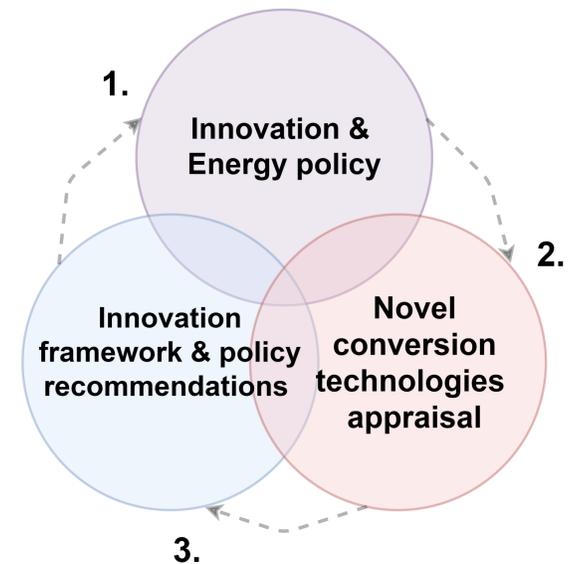


Figure 1 – PhD research areas

## Background – Technology innovation

In general market pull promotes incremental innovation [1][2], while technology push can promote higher risk step-change innovation [1][3][4]. The experience curve in Figure 2 shows the aggregation of incremental innovations alongside deployment [5].

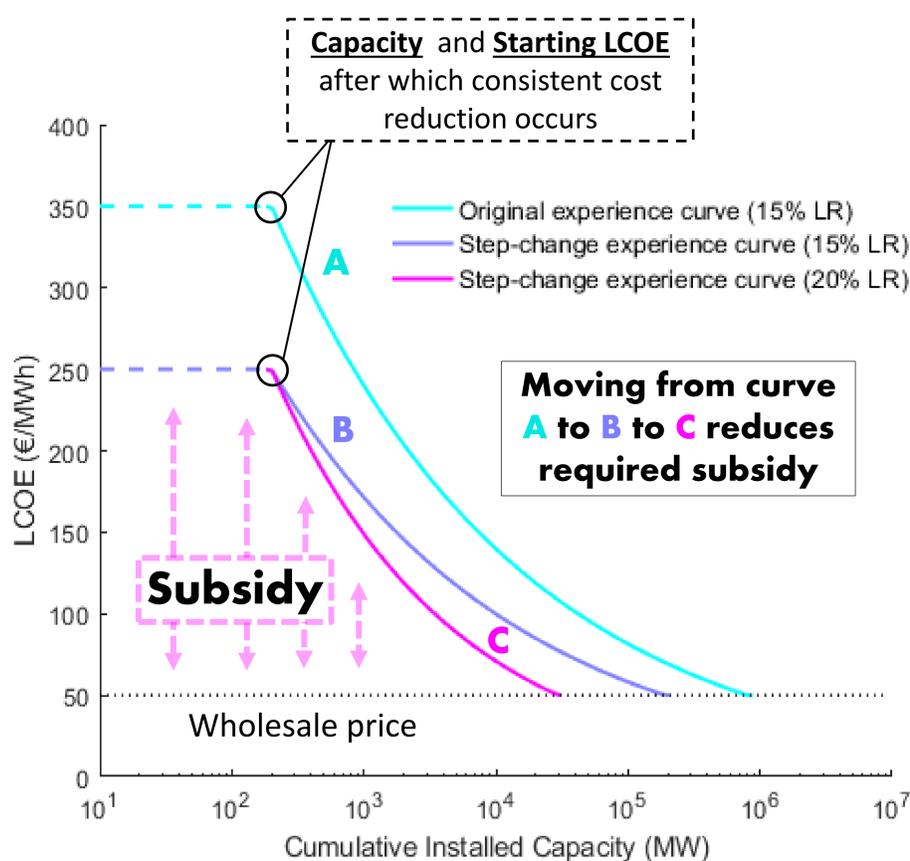


Figure 2 - Transition from experience curve A to B illustrates a technology step-change

## Results - The value of step-change innovation

Point A shows a plausible learning investment for the wave energy sector applying current LCOE estimates.

- RD&D policies that target step change innovation can significantly reduce this learning investment (B)
- Policies that drive Higher Learning Rates (C) and learning from a lower Capacity can also reduce learning investment (however the underlying mechanisms that effect these parameters are more complex)

## Theory - Learning investment

Three parameters are key to determining the learning investment (total required subsidy) for a renewable energy technology to meet cost parity:

- Learning rate (LR) percentage LCOE reduction for every doubling of deployed capacity
- Capacity ( $C_0$ ) after which consistent cost reduction occurs
- Starting LCOE ( $LCOE_0$ ) after which consistent cost reduction occurs

Policy interventions such as public RD&D, research networks etc. can effect these parameters

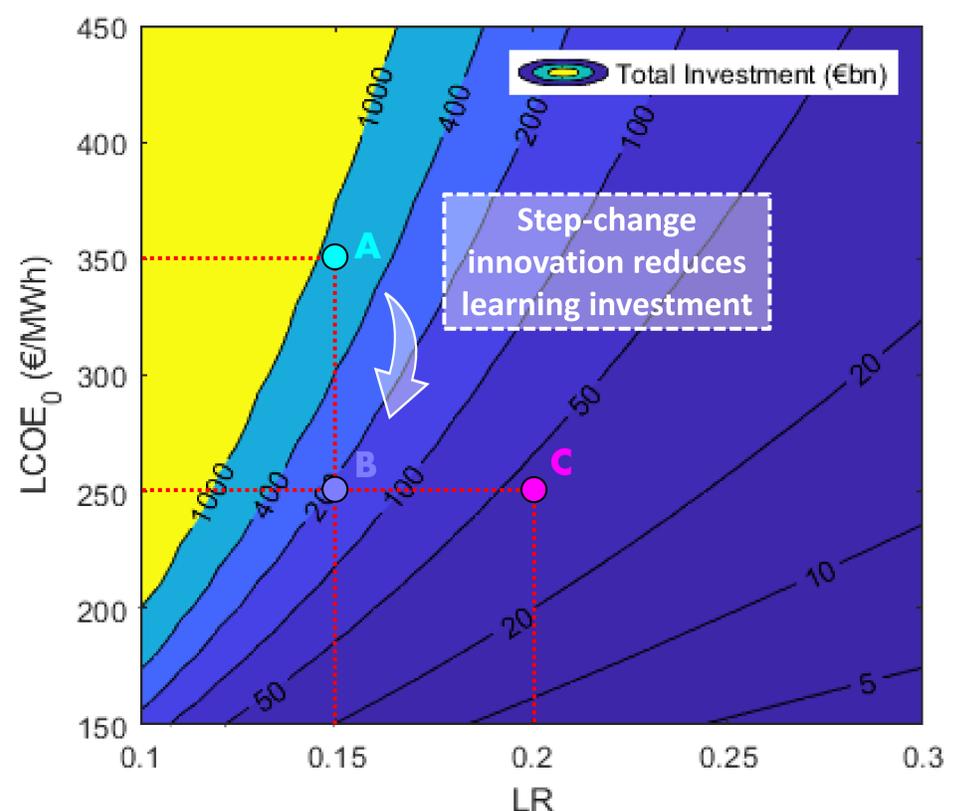


Figure 3 – Contours show total learning investment required to meet cost parity under different combinations of LR and  $LCOE_0$  ( $C_0 = 200$  MW)

### References:

- [1] Norberg-Bohm, V. (2002). THE ROLE OF GOVERNMENT IN ENERGY TECHNOLOGY INNOVATION: INSIGHTS FOR GOVERNMENT POLICY IN THE ENERGY SECTOR.
- [2] OECD. (2015). Emerging Technologies & Firm Dynamics: The Implications of Green Growth.
- [3] Preece et al (2000). <https://abdn.pure.elsevier.com/en/publications/technology-organizations-and-innovation-critical-perspectives-on-4>
- [4] Nemet et al (2006) [10.1016/j.enpol.2005.06.020](https://doi.org/10.1016/j.enpol.2005.06.020)
- [5] Gross et al (2018) [10.1016/j.enpol.2018.08.061](https://doi.org/10.1016/j.enpol.2018.08.061)
- [6] IEA. (2000). [10.1787/9789264182165-en](https://doi.org/10.1787/9789264182165-en)