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SUPERGEN UKCMER

Life Cycle Assessment of The Pelamis WEC

Introduction

The **environmental impacts** of wave energy conversion are poorly understood, with existing studies mostly focussed on potential climate change impacts and embodied energy [1-3].

This study applied life cycle assessment (LCA) methodology to the first-generation **Pelamis wave energy converter** (WEC), examining a broad range of environmental impacts.

Results

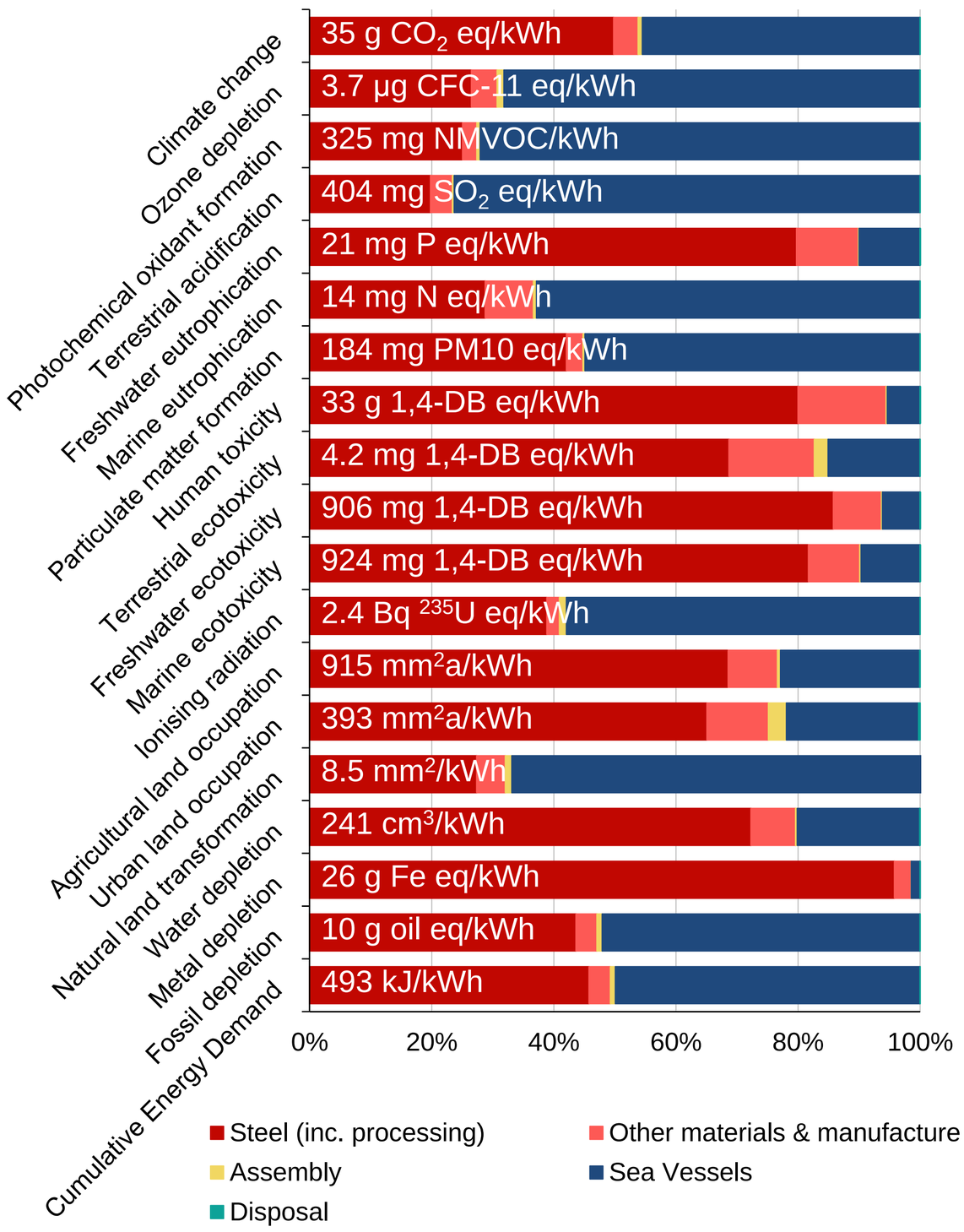

Figure 2: Breakdown of impacts by life cycle stage [5]

Method

LCA involves systematically analysing resource use and pollutant emissions at each stage of a device life cycle, and characterising these as environmental impacts.

The **whole life cycle** of the Pelamis (fig. 1) was considered from cradle to grave, and included the device, moorings and sub-sea cable up to the grid connection. The case study was for a typical wave farm located off the north-west coast of Scotland.

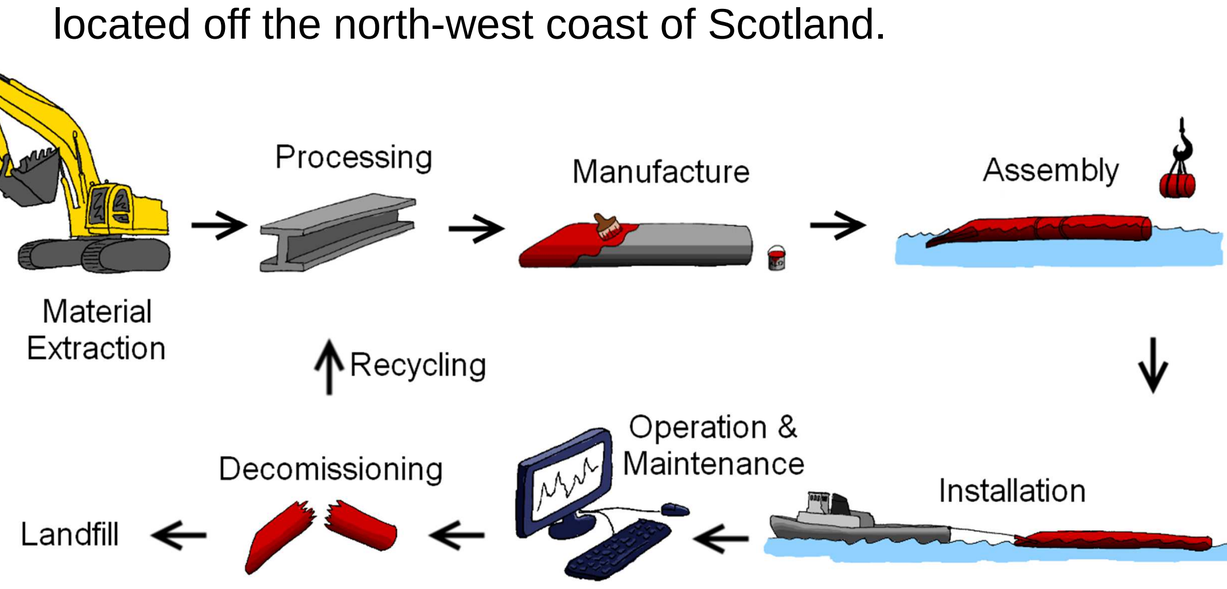

Figure 1: Pelamis life cycle

Conclusions

- Lower environmental impacts than fossil generation in some categories
- Often performs worse than other types of generation
- Carbon footprint 35 g CO_2eq/kWh & **carbon payback in 24 months**
- **Energy return on investment 7.5**
- Greatest potential to reduce impacts in steel consumption and sea vessel operations (fig. 2)

References

1. HC Soerensen, S Naef (2008) "Report on technical specification of reference technologies (wave and tidal power plant)," SPOK
2. RPM Parker, GP Harrison, JP Chick (2007) "Energy and carbon audit of an offshore wave energy converter," *Proc. IMechE Part A: J. Power and Energy, 221(A8):1119-30*
3. A Uihlein (2016) "Life cycle assessment of ocean energy technologies," *The International Journal of Life Cycle Assessment,* 21(10):1425-37
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