Justice, innovation and emerging technologies: marine energy, hydrogen & Orkney energy futures

Lara Santos Ayllón
Science, Technology and Innovation Studies, year 2

Lead Supervisor: Dr. Kirsten Jenkins
University of Edinburgh

Industry Supervisor: Eileen Linklater
European Marine Energy Centre

Co-Supervisor: Dr. Sandy Kerr
ICIT, Heriot-Watt University

Waverider deplyoment at EMEC Billia Croo wave test site. Credit: Colin Kelide

Waverider Buoy and ADCP deployment to Billia Croo. Credit: Colin Keldie

Background

The Orkney Islands is an archipelago off the north coast of Scotland, world-known for ongoing research and innovation in the renewable energy arena. It is often self-called a testing ground, or "living lab" for the pilot demonstration of new technologies, and known by many as the "Energy Islands" (Watts, 2018). It is also one of the regions in the UK with the highest levels of fuel poverty and sits on the most northerly point of the UK national grid – at the periphery of existing, centralised supply chains and connections.

Wave and tidal are two emerging, innovative technologies, which will play different roles in the energy transition. Both technologies are being tested by the European Marine Energy Centre (EMEC), an 'innovation catalyst' operating as an R&D and Demonstration centre in Orkney.

Given these technologies' emerging nature, there is opportunity, and risk, associated with how they will be developed and deployed. In addition, these processes will determine wider dynamics of our socio-energy future, in a time when energy system transformation is at the top of agendas, and the "just transition" has gained relevance worldwide.

In this context, our absolute interdependence with energy infrastructures creates, through our response to climate change, an opportunity to radically transform our socio-energy system to improve social and ecological justice overall. Ultimately, the transition to net-zero will be neither sustainable nor credible if it creates or worsens inequalities (Abram et al., 2022). The creation of new industries, like the ocean energy industry, provides an opportunity to transform the sector and its impacts from within.

This research explores and contributes to our understanding of this conceptually, methodologically and empirically, in Orkney, and in relation to these emerging technologies as they undergo processes of innovation.

This project encompasses both ocean energy and hydrogen.
Given ICOE-OEE themes, this poster is focused on wave and tidal energy.

Supporting the future of ocean energy
Blue collaboration and knowledge sharing - Engaging and involving local communities and businesses

Conceptual contribution

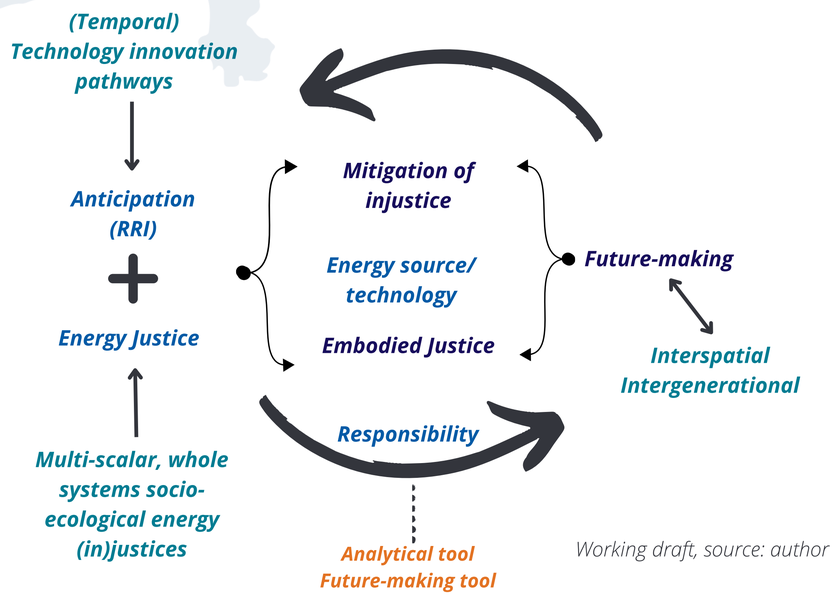
Working with theories of energy justice (e.g. Jenkins et al., 2014) and responsible research and innovation (RRI) (Stilgoe et al., 2013), this research will scrutinise the development of wave and tidal energy as emerging energy sources.

The conceptual framework below illustrates this integration. The anticipatory nature of RRI methods enables the mobilisation of energy justice thinking before a technology is locked in.

By building anticipation, self-reflection, inclusive deliberation and responsiveness (RRI) into energy justice engagement and analysis:

- What are the impacts and how are they distributed?
- How are procedures undertaken?
- Whose voices are heard, whose are misrecognised? Who has been historically marginalised?

We can scrutinise an energy source, or a technological object, and identify risks of injustice alongside their potential for just transition building, before they are mass deployed.



Working draft, source: author

Do wave and tidal energy have the potential to mitigate historical climate injustices?

Do they create new risks of injustice and disempowerment?

Methods: Co-creation as a key Research Design phase

This research has built in a co-creation phase in the form of virtual workshops, held in September 2022.

These workshops included EMEC staff, many of whom are also local Orkney community members. We explored ocean energy's distinctive characteristics and the impacts wave and tidal energy could have on global energy systems, and locally in Orkney. Specifically, we assessed the justice risks and opportunities across the three dimensions of **distribution, procedure and recognition.**

In 2022-23, I aim to engage with a wide range of industry participants – from technology developers, engineers, regulators, policymakers and community members. If this interests you, please get in touch!

Mocean deployment, EMEC. Credit: Colin Keldie

Hypotheticals... Ocean energy for a Just Transition?

Cost/benefit distribution
Profoundly spatially distributed nature of the resource.

Energy security for island and coastal communities?

Correcting historical injustices, and benefiting future generations?

Correcting or maintaining sector workforce inequalities?

Systems thinking
Supply chain development

Ocean energy impact on energy system infrastructural development?

Ocean energy technology relationship with biodiversity, and ocean species justice?

Power and ownership
Risks of ocean space privatization?

Monopolised or shared energy market?

Technological design and access versus viable ownership models?

References
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Lara M. Santos Ayllón
Contact:
lara.santos@emec.org.uk
s1993576@ed.ac.uk

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