

SuperGen Plus - Environmental Research Institute

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Strategies for Marine Energy

Introduction

The Pentland Firth and surrounding area contain 6 of the top 10 sites in the UK for tidal development. The area has the potential to deliver 700MW of tidal energy by 2020 with estimates that this could actually be 30 times more.



1. The Pentland Firth - An image by the Crown Estate

The Pentland Firth has great potential for renewable energy but the geographic location poses a number of constraints. The dynamic nature of the tidal races pose limits on the areas which can be utilised and the potential for connection to the grid remains a continuing problem.

Challenges

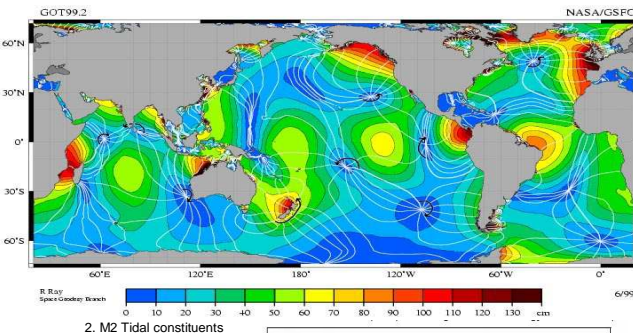
Marine energy is an emerging technology with limited information on reliability, maintainability and availability. Intermittent and highly variable power output mean power may be generated at times of low electricity demand

Optimisation of marine energy

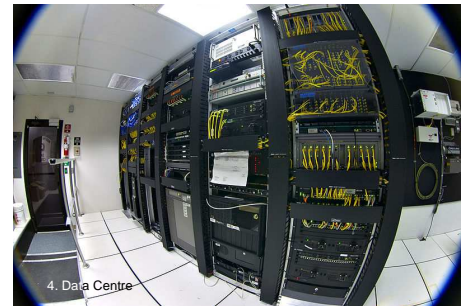
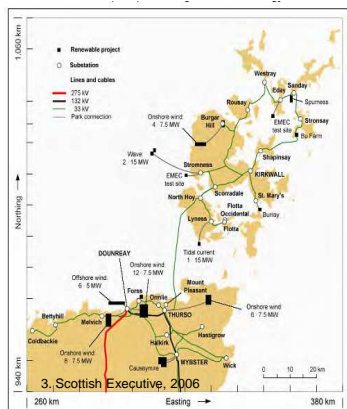
Examine the difficulties in getting electricity from this turbulent environment – grid connection restraints
Examine how the energy produced can be optimised

Initial Strategy

Understanding the intermittency of waves and the variability of tidal flows. Although highly predictable, there is a large variation in the maximum tidal flows so potential output is variable, posing challenges for the grid



Consider whether grid connection opportunities can be realised in the geographic location. Significant upgrades to the system would be required to connect large scale arrays



4. Data Centre

Examine the potential of off-grid technologies and industries to use or store the energy produced e.g. data centres



5. Stwlan Dam

The use of local tidal lagoons and pumped storage schemes to store energy



6. Hydrogen fuelling nozzle

Storage of electricity in fuel cells or hydrogen production e.g. hydrogen cars

Acknowledgment

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References

- *1: The Pentland Firth – An image by the Crown Estate
- 2: M2 Tidal constituent - Source R. Ray, [TOPEX/Poseidon: Revealing Hidden Tidal Energy en:GSFC en:NASA](http://topex.poseidon.fr/Revealing_Hidden_Tidal_Energy_en/GSFC_en/NASA)
- *3: Scottish Executive, 2006. Matching Renewable Energy with Demand.
- 4. Telecommunications equipment in one corner of a small data center. Contributed and licensed under the GFDL by the photographer, [Gregory Maxwell](http://www.flickr.com/photos/gregorymaxwell/).
- *5. Hydrogen Fuelling Nozzle - http://www1.eere.energy.gov/hydrogenandfuelcells/pdfs/doe_h2_safety.pdf
- *6. Stwlan Dam by Adrian Pingstone 1988