

2009-01-01

Marine Current Energy Status and Its Potential in Ireland

Fergal O'Rourke

Technological University Dublin, fergal.orourke@tudublin.ie

Fergal Boyle

Technological University Dublin, fergal.boyle@tudublin.ie

Anthony Reynolds

Technological University Dublin, anthony.reynolds@tudublin.ie

Follow this and additional works at: <https://arrow.tudublin.ie/engschmecoth>



Part of the [Civil and Environmental Engineering Commons](#)

Recommended Citation

O'Rourke, Fergal and Boyle, Fergal and Reynolds, Anthony: Marine Current Energy Status and Its Potential in Ireland. Poster Presentation for Energy Solutions Ireland, 2009.

This Other is brought to you for free and open access by the School of Mechanical and Design Engineering at ARROW@TU Dublin. It has been accepted for inclusion in Other resources by an authorized administrator of ARROW@TU Dublin. For more information, please contact arrow.admin@tudublin.ie, aisling.coyne@tudublin.ie.



This work is licensed under a [Creative Commons Attribution-Noncommercial-Share Alike 3.0 License](#).



Marine Current Energy Status and its Potential in Ireland

Fergal O'Rourke, Fergal Boyle, Anthony Reynolds
Department of Mechanical Engineering



1. Introduction

The energy consumed in Ireland is primarily obtained by the combustion of fossil fuels. As well as fossil fuels continually becoming more expensive and fluctuating in price, their use as an energy source also has a negative impact on the environment. The seas offer an enormous clean energy resource in the form of waves and currents. However this energy can only be harnessed if the energy extraction technology is developed to exploit this resource economically. The use of marine current energy technologies will assist in sustainable development as well as being a solution to several energy related environmental problems.

2. Ireland's Energy Requirements

The majority of Ireland's energy is consumed by electricity generation, heat generation and transportation. Ireland is heavily dependant on fossil fuel imports to meet these energy requirements. Ireland's energy import dependence reached 91% in 2006[1], making Ireland the most import dependant country in the EU. With regard to renewable energy the following targets were set by the Irish government in the energy white paper published on the 12th of March 2007:

- 15% of Ireland's electricity consumption will be generated from renewable sources by 2010, and 33% generated from renewable sources by 2020.
- 500MW of ocean energy capacity and 800MW of CHP to be installed by 2020.

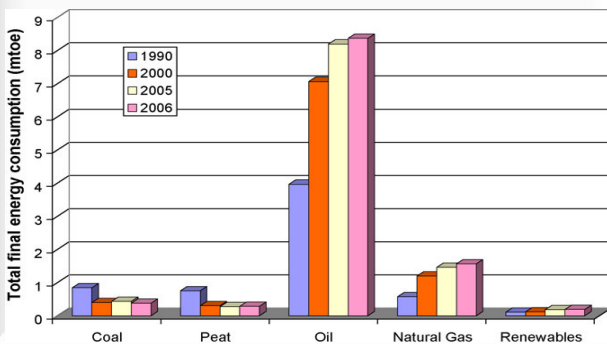


Figure 1. Total Final Energy Consumption in Ireland by Fuel[2]

3. Current Status and the Main Technology Challenges of Marine Current Turbines

The worldwide demand for the increase in the use of renewable energy technologies to fulfil energy needs has led to major advances in marine current energy technology. However electricity generated from marine current turbines is still in its infancy with only a few trial models being connected to a national grid. Currently, the only marine current turbines which have been installed and grid connected are SeaGen, developed by Marine Current Turbines Ltd[3], Tidal Stream Turbine, developed by Hammerfest Strom, and the Open Centre Turbine which is a scale model developed by Open-Hydro Ltd.

There are various challenges facing the development of marine current turbines. Some of these challenges include loadings, operation in marine environment, maintenance, and cavitation problems. These challenges can be sub-divided into four basic categories, namely design, installation, integration and size increases. The following need to be addressed to commercially develop marine current turbines:

- An in-depth resource analysis conducted.
- Design and manufacturing issues.
- Device installation issues.
- Operational and survival issues.
- Lifecycle costs.

4. Harnessing the Energy from Ireland's Tides

Ireland has an excellent theoretical marine current energy resource. However this resource is limited by practical, accessible and viable constraints. The marine current energy sites which contain the greatest potential are primarily located in the St. Georges and North Channels and along the east coast of Ireland. The relative potential of these marine current sites are largely influenced by the local geometry of the flow channel.

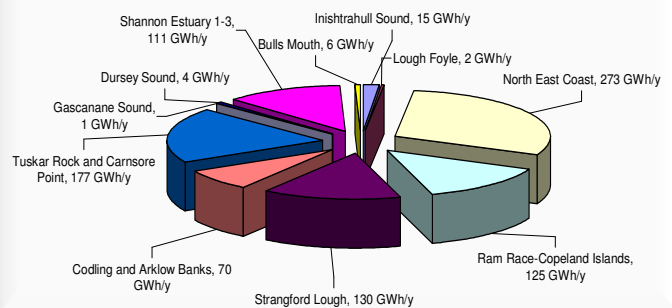


Figure 2. Viable marine current energy resource in Ireland (GWh/y)

5. Drivers for Deployment of Renewable Energy

There are numerous drivers and motivators for the deployment of renewable energy technologies in Ireland. Some of the drivers include[4]:

- Security of energy supply.
- Environmental concerns.
- High and fluctuating fossil fuel prices.
- Technology development and business perspectives.
- Agricultural, rural and social issues.

6. Conclusions

Marine current energy has the potential to play an important role in the future energy supply in many countries around the world. The resource has various attractable characteristics, such as predictability.

Ireland has an excellent marine current energy resource due to its geographical location. There are several sites identified as economically viable for commercial scale generation. However, there are numerous other sites which have not been included due to sites with a marine current velocity of less than 2 m/s being excluded. As the technology is developed it is expected that energy extraction from these sites will be economically viable.

7. References

1. SEI, Energy in Ireland Key Statistics, 2008.
2. O'Rourke, F., F. Boyle, and A. Reynolds, *Renewable Energy Resources and Technologies Applicable to Ireland*, Renewable and Sustainable Energy Reviews, **In Press, Corrected Proof**.
3. Fraenkel, P.L., *Marine Current Turbines: Pioneering the Development of Marine Kinetic Energy Converters*, Proceedings of IMechE Part M A Journal of Power and Energy, 2007(221).
4. I. Government, Delivering a Sustainable Energy Future for Ireland, 2007.