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Enhanced Hydro-environmental Assessment of Tidal Range Schemes

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There has been a growing international interest in reducing CO_2 emissions in response to record breaking atmospheric CO_2 levels, which are considered to be the main contributor to climate change. The Climate Change Act, in the UK, mandates emission cuts of 80% by 2050. Marine renewable energy and tidal range schemes are playing an increasing significant role in many parts of the world due to this vast untapped resource. It is estimated that in the UK tidal range resource is between 25 and 30 GW(1). Tidal Range Schemes (TRSs), such as tidal lagoons and barrages, have a significant advantage over many other forms of renewable energy generation in that they are based on a resource that is highly predictable. There have been several proposals to build a number of TRSs around the UK, and globally. In particularly, in January 2017, the independent Hendry Review, commissioned by the UK government, recommended that construction of the world's first tidal lagoon in Swansea Bay, which is part of the Bristol Channel and located in the South West of the UK. However, one of the main concerns with TRSs is their potential hydro-environmental impacts. This study investigates the hydro-environmental impact of TRSs. The main focus is the accurate implementation of the hydraulic structures by conserving momentum of the fluid flowing through the structures. The potential improvements in hydro-environmental predictions gained as a result of momentum conservation will also be discussed.

1. DECC, in https://www.gov.uk/guidance/wave-and-tidal-energy-part-of-the-uks-energy-mix#tidal-range-potential. [Accessed: 11/04/2016]. (2013).