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TITLE: A review of the potential water quality impacts of tidal renewable energy systems

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ABSTRACT:

The continued increase in the demand for energy, growing recognition of climate change impacts, high oil and gas prices and the rapid depletion of fossil fuel reserves have led to an increased interest in the mass generation of electricity from renewable sources. Traditionally, this has been pursued through riverine hydropower plants, with onshore wind systems growing steadily in popularity and importance over the years. Other renewable energy resources, which were previously not economically attractive or technically feasible for large scale exploitation, are now being considered to form a significant part of the energy mix. Amongst these, marine and in particular, tidal energy resource has become a serious candidate for undergoing mass exploitation in the near future, particularly in places with a tidal range of 4 m or more. Tidal renewable energy systems are designed to extract the kinetic or potential energy flow and convert it into electricity. This can be achieved by placing tidal stream turbines in the path of high speed tidal currents or through tidal range schemes, where low head turbines are encapsulated in impoundment structures, much like in low head riverine hydropower schemes. It is thought that these systems, when implemented at scales required to generate substantial amounts of electricity, have the potential to significantly alter the tidal flow characteristics, which could have knock-on impacts on the hydro-environment. This review gathers together knowledge from different research areas to facilitate an evaluation of the potential hydro-environmental impacts of tidal renewable energy systems, with a particular focus on water quality. It highlights the relevance of hydro-environmental modelling in assessing potential impacts of proposed schemes and identifies areas where further research is needed. A case study is presented of recent modelling studies undertaken for the Severn Estuary.

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