Title: Functional Scoping of Two-Way Tidal Range Schemes: Essential Signposts to Success for a 21st C Game-Changer?

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Abstract

Scoping of high-flow, two-way tidal range schemes may use ideas from the steady state run-of-river situation, and from hydro schemes involving the filling and drainage of a reservoir. Thus if a hydro scheme has a constant water supply, its effectiveness relates only to the headline efficiency of plant. But if water supply is from a reservoir, small changes in hydraulic efficiency can greatly affect whole-cycle energy extraction. Results of two thought-experiments based on this dilemma are here compared with findings for two-way generation at La Rance in Brittany in the 1970's, and are used to suggest why single, asymmetrically functional bulb turbines are unlikely to provide optimal 21st C tidal range solutions. Since a 2010 UK government sponsored study outlined a generically superior alternative, it is urged to be in the common interest of all countries for which a tidal range market could help them lead worldwide climate change adaptation and mitigation to see this technology developed soon. Reasons include not just the format's symmetrically better generation performance, but that its pumping efficiency stands to allow a tidal range scheme to dispense with sluices, maintain a more closely 'naturalised' basin excursion pattern, and extract energy from outside the impounded area with better whole-cycle performance. The technology, described by its authors as 'ideal for lagoons', has to date been overlooked for the Swansea Bay lagoon because of the 'Severn Embryonic Technology' title of the 2010 study, and an idée fixe that bulb turbines' 'maturity' equates to their being fit-for-purpose. In the UK, such preconceptions risk failure to pilot a strategically significant technology predictably empowering and protecting many vulnerable coastal towns and cities, including London, by 2050 at a cost potentially comparable to that of offshore wind.

Biography

Dr. Stuart Anderson is a retired GP for several North Wales coastal towns badly flooded in 1990 in a storm surge – a disaster involving the evacuation of 5,000 people and widely felt at the time to be a harbinger of the future as regards climate change In 1975-78 he had served rural mission hospitals in Zaire, where he led procurement and installation of a small hydro-electric turbine. On return to the UK he led development of a fluorimetric assay (now standard) for the intracellular energy-related vitamin thiamine, leading to full-length papers in Annals of Clinical Biochemistry and Lancet. Before serving on Conwy CBC, Stuart advocated floodplain resilience and championed the North Wales Coastal Cycle Route. In 2008 his ideas for a counter-positioned, contra-rotating (CPCR) twin pump/turbine tidal range format were fed into the Severn Embryonic Technology Scheme, informing the Atkins/Rolls-Royce study and leading to an invitation onto DECC's Marine Energy Programme Board. On behalf of Cardiff University's Hydro-Environmental Research Unit, since 2011 he has led regional liaison for two 5-nation EU funded 'MAREN' Interreg projects. Since 2014 he has also been community liaison Board member for the North Wales Tidal Energy and Coastal Protection Co Ltd, and in 2015 he chaired the 'Irish Sea 2050' conference, exploring how communities on the Irish Sea Rim could collaborate over low-carbon futures.