Beyond the Barrage: Harnessing the Power of the Tides in the Severn Estuary

For over 150 years the Severn estuary has been at the centre of proposals to exploit its tidal range to generate electricity. As a source of predictable, renewable and supposedly carbon-free power with the potential to supply up to 5% of current UK electricity needs, such interest is understandable. Despite the failure of the most recent concept to secure government and public support (summer 2013), a new design is already being put forward and its potential environmental implications assessed. How is it that a barrage still hasn’t gone beyond the drawing board? And why are companies, scientists and politicians still willing to invest time, effort and money in further proposals? These are two questions addressed in a PhD research project in the Department of History at Bristol University. Though the past century and a half is the main focus of the project, the issue is also investigated in relation to more recent attempts to harness tidal power and how the activities of people whose lives were bound up with the estuary’s daily ebb and flow were enacted spatially along the river at the interface between land and sea.

150 Years of Severn Barrage Proposals

In 1849 the engineer Thomas Fulljames depicted his vision for a new means to overcome the difficulties of crossing the Severn Estuary. Though ferries and crossing points existed at various locations between Gloucester and Bristol, including Brunel’s New Passage ferry, the journey by rail from London to South Wales was indirect and tedious. Fulljames proposed shortening the journey by building a road and rail link between Aust and Beachley. But, rather than a standard bridge, his concept comprised a solid masonry wall which impounded water upstream in a large tidal lake suitable for recreation—the first barrage proposal. Yet until the 19th century was the idea of harnessing the Severn’s tidal power for electricity advocated.

The earliest date usually cited is around 1904. Since then, designs, concepts and key government reports have been published every decade, notably in the 1930s, 1940s, 1970s, 1980s and 2010s. The underlying principle behind each concept has remained relatively unchanged, comprising the impounding of water behind a fixed linear barrage during the flood tide, and its subsequent release at low water just before the tide turns. Yet each proposal has varied regarding size, location, cost and estimated generating capacity.

The Tides as a Source of Subsistence

Current interest in exploiting tidal power for electricity represents the most recent manifestation of a closer relationship that has existed for at least 8,000 years. Evidence for hunting and fishing by semi-nomadic peoples along the foreshore has been identified at various locations, notably Goldcliff on the Gwent Levels, whilst fishtraps and fishing wrens—the earliest examples dating from the early medieval period—are ubiquitous around the coastline of the Severn and Inner Bristol Channel. These activities were wholly reliant on the continuous movement of water, and the interchange between salt and fresh water.

The use of the tides to secure the daily catch is most clearly represented by the pottery: a conical-shaped wicker basket, often arranged in rows as fixed engines in more recent centuries, which trapped fish either as they were conveyed upstream by the flood tide or, if facing upstream, downstream in the ebb, thereby preventing escape. The practice continued at a reduced level, although now more often employing metal as opposed to wicker baskets. Barrage construction would render such an activity unviable whilst the reduction in tidal range could potentially leave current fishing structures high and dry, resulting in increased levels of erosion, degradation and eventual destruction.

Sailing with the Tide

The Severn has also long been an artery of trade and commerce, connecting communities of England and Wales with the coastline of north-western Europe and, in turn, the open ocean and the wider world. Before vessels powered by steam and oil, navigation around the Severn’s tidal waters was wholly dependent on an intimate knowledge of the tides, demonstrated most clearly by the ability of brawny to ride the Severn bore upstream to the port of Gloucester, and the distribution of public houses along the river banks indicating the places where they would have to stop whilst awaiting suitable conditions for the return journey.

Electricity Generating Power Stations

Even with increased motorisation, any venture upstream, downstream or cross-channel must remain in unison with the tides. As with any significant power station to supply electricity in a world of consolidated ownership, there would be a need to stop whilst awaiting suitable conditions in union with the tides. Bristol Channel and Severniade pilots remain some of the most skilled practitioners of their trade in the world. Would a reduction in the tidal range lead to their eventual demise?

The Power of the Water

Whilst the concept of a tidal barrage to generate electricity is nothing new it is also important to recognise the origins of the technology itself, which can be shown to date back as far as the 7th century in north-western Europe. At the early medieval monastic settlement of Nendrum in Strangford Lough, Northern Ireland, archaeological excavations have revealed two tide mills and associated mill pools, and work on the shores of the River Fleet in London has also unearthed evidence for a possible Roman tide mill. Tide mills, similarly to a barrage, can operate on impounding water and releasing it through a water wheel when the tide had fallen sufficiently outside the barrier. This generated mechanical energy for various purposes, including fulling cloth and grinding wheat into flour. Such facilities were found along many of Europe’s Atlantic coasts during the medieval and post-medieval periods, and were once commonplace in the north-western United States and Canada.

The Power of the Water—Connecting Past and Futures

Now there are only a handful of working examples, including Elgin Tide Mill on the Solent. On the Severn the only two possible examples have been identified so far, including Sea Mills, near Eling, and one at Wedbury-on-Severn which has been converted into a domestic dwelling. The likelihood of such facilities ever being used on a commercial basis again are remote. But with a growing interest in the conversion of former watermills to new use as small-scale electricity generators, and in light of such an activity being allowed, there may still be a bright future for tide mills.

The Tides as a Source of Subsistence

Imagined Futures

Through a combination of primary and secondary sources, including documentary and archaeological evidence, as well as the work of artists and writers, this research is gradually bringing to light the scale, extent and significance of the relationship between people and the changing tides. This study of how the Severn’s legacy as a source of power and subsistence can be understood in the context of the future shows the potential for the Severn Barrage to revitalise local economies, support new industrial activities, and provide a fascinating backdrop to the more leisure-based endeavours, and navigation by recreational sailors involves little danger provided they possess a working knowledge of the tides.

Tidal Power in the Severn Estuary: Predicted and Imagined Futures

The proposals to harness the power of the tides through construction of barrages, lagoons and tidal stream turbines are thus particularly notable for engendering renewed interest in this remarkable resource and the fact that, rather than simply comprising a basic commodity to be exploited, it is also of great cultural and environmental importance. This has implications for the estuary and its inhabitants, both now and in the future. What does the future hold in store for the tidal Severn, and how can knowledge and awareness of the past be of relevance to future development? This is an issue that will form a significant component of the project leading ultimately to the creation of a number of imagined scenarios based in large part on what has either taken place before or has been conceptualised but never made a reality. It seems almost certain, particularly with the progress currently being made by advocates of a tidal lagoon in Swansea Bay, that the power of the tides in the Severn will persist for some time as a subject of great debate and environmental further efforts to exploit their potential remain attractive.

This research is part of a larger interdisciplinary and multi-institutional project involving PhD students, post-doctoral researchers and academics from the Universities of Bristol, Nottingham and East Anglia: “The Power and the Water—Connecting Past and Futures.” For further information about themes, examples of output and the frequently updated blog see: www.powerwaterproject.net.