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Sustainable Thornbury

Oldbury Tidal Reservoir

Physical Description Report: Tidal Twin Reservoir

This report has been put together by Jeff Gash, Engineer, supported by Sustainable Thornbury in 2007.

Proposal

To construct a 'Tidal Twin Reservoir' on the site of the Oldbury Power Station low tide reservoir; the ebb and flow of the tide to then be harnessed by turbine generators. (The station is about to be decommissioned)

This plan would be a pilot for additional 'Tidal Twin Reservoir' along the Severn Valley, negating the need for a more destructive barrage. The affects of a Reservoir would be minimal to wildlife as the ebb and flow of a small area is only slightly reduced.

Detail

A 'Tidal Twin Reservoir' would involve the additional laying of another sea wall further into the River Severn (With public footpath for interest) and would need to some extent need to be impervious and able to support at most, a half tide range.

Four single direction turbine generators would be placed on the Reservoir side of the wall at the deepest point with concrete buildings erected to house the generators and sluices required. The sluices direct the flow to the correct side of the turbines dependant on ebb or flow of the tide, in addition to setting up a sufficient head to start the turbine at a minimum speed.

Twin – To generate additional energy from this tidal range, a second wall or Reservoir would create a second bite of the same tidal power. On an out going tide, the sluices would be opened from the main Reservoir to 2 of the turbines and released into the second Reservoir. When this also creates a head from the outgoing tide, another pair of sluices would be opened to the second pair of turbines.

Maximising the energy production and to reduce silting up of the Reservoir itself, Washbasins at either end of the Reservoir are filled by the last twelfth of the tide using sluices and let through to the Reservoirs when the head is not enough to run the turbines. This serves 2 purposes, allows more water to create power from the additional head on the outgoing tide, but also creates turbulent flow in an area where the water would normally allow the silt to settle.

The above electricity generation would be connected to the grid via the current power connection at the Power Station, making this proposal a consideration in the decommissioning of Oldbury Station.

Wind farms

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The above project would lend itself to other power generation forms as the building of a sea wall could carry extra grid connections to a wind farm built on the rocks nearby. Other ideas for tidal generation could also be tested here.

Barrage impact

If the go-ahead was given in the future for the Severn Barrage, then only the high tide is affected dependant on how the barrage is managed, reducing the amount of head available to the 'Tidal Twin Reservoir' by a minimal amount. The low tide is already restricted by its physical position.

Severn River flow

The current reservoir lends itself to this project though the new sea wall would redirect flow by a minimal amount; certainly at low tide it will have no effect. The main flow at mid tide will create a more centralised flow to be moved slightly West. The high currents produced by bringing the sea wall close to mid channel will, if channelled correctly, create additional flow and reduce the head required to run the turbine. i.e. put the turbine entrance in line with the flow for the incoming tide. Sluices then redirecting the flow for the correct orientation of the turbine for the outgoing tide, but probably relying more on head than flow as the water in the Reservoir will not have such kinetic energy.

Future

New additional Reservoirs would need the natural flow of the river to be considered and the above project would produce a good study as to the effects to the natural flow and the surrounding wildlife. Additionally some recreational aspects could be brought to future projects. For example to create rapids for canoeing events, create safe areas for windsurfing and other water-sports. A manmade beach could also feature with safe bathing areas. Another requirement would be the protection of the Severn's natural feature of it's 'bore'.

Differences to the Lagoons planned by Tidal Electric.

The Reservoir has only 2 sides to construct and with connection to the land, cables can be run to the turbine house at the same time, in addition to providing connection to other sources of supply. Construction only requires ordinary earth movers due to the link to the land, therefore less cost to build.

With Reservoirs - redirection of flow is minimal and therefore effects are not unknown.

The Reservoir does not flood over the sea wall (using current sea wall heights), providing additional habitat for wildlife and public access.

Something that may prove beneficial to the Lagoons is the use of sluice gates to flush sediment, though for the Lagoons only it would reduce energy production at flushing times

Supporting quotes from other sources:

Environmental aspects

Severn (mean spring tidal range 12 m);

Construction of bunded reservoirs built on intertidal areas would have different environmental effects compared to conventional barrages. Attention to site-specific conditions, notably hydraulic flows, sediment erosion, transport and accumulation would need to be thoroughly understood to prevent souring or adverse accumulation within the basins. If these schemes resulted in permanent inundation

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of intertidal feeding areas, migratory bird populations would be displaced, although the impact would depend on their original importance.

From the WEC survey of energy resources web page

James Craig
AEA Technology
United Kingdom

"We agree with the Assembly that there's huge potential to take advantage of the tidal range in the Severn Estuary for energy generation as it is the second highest tidal range in the world. We strongly recommend that more suitable technologies are deployed to capture the energy of the Severn Estuary, such as stand-alone tidal generators, tidal fences and further research into tidal lagoons," Parry added.

Source WWF for a living planet from the news wales website

Next step:

Tidal Electric are ahead of the game in backing the Lagoon project, backing therefore will need to be found quickly for this to be a contender.

Registering this idea with the following bodies:

Severn Vale Energy Agency, Unit 6/15, The Mews, Brook Street, Micheldean, Gloucestershire. GL17 0SL

Sustainability and Environmental Technologies Team, Government Office for the Southwest, 2 Rivergate, Temple Quay, Bristol. BS1 6EH

British Hydropower Association, Unit 12 Riverside Park, Station Road, Wimbourne, Dorset. BH21 1QU

Centre for Alternative Energy, Machynlleth, Powys. SY20 9AZ

Sign up for the Marine Energy Challenge.