

RIVER AND ESTUARY OF RIVER TAY
POTENTIAL USE OF TIDES FOR GENERATION OF ELECTRICITY

Courtesy Hamish Robertson 2007

In 1841 proposals were being made to consider restriction of the width of river Tay to increase the tidal flow over a narrower river and estuary, causing sand to be moved from the bed of the river and out to sea, thus deepening the river approaches to the port of Dundee and making the port more suitable for the larger ships then being constructed and planned.

THE PRESENT:

Recent developments in the technology applicable to the use of natural power to generate electricity, and the growing concern about global warming, and the inevitable large increases in the costs of power whether generated from oil, gas or nuclear power all contrive to direct attention to the use of natural resources as attractive alternatives.

There are three natural sources of energy namely wind power, wave power and tidal power. A great deal of money and resources have been directed to studies on development of these resources and some progress has been made, particularly on wind power (and Dundee has an excellent example at the Michelin factory). Wave power has been getting a lot of favour in recent months. Of these three natural sources of energy, tidal power has been, to a large degree, the forgotten one.

Wind power is an attractive and identifiable use of natural resources for power generation and, having seen large swathes of highland landscape well covered with turbines which are readily available for maintenance and repair and I must admit to having some admiration for development of that source of energy.

Wave power is, by its nature, developed off-shore in areas where frequent and large waves and swell are frequent and it is apparent that off-shore wind power and wave power should be taken together for some aspects of maintenance and remoteness. Pentland Firth and Orkney are two locations being favoured for development of off-shore wind power and wave power installations.

There are problems associated with moving energy from remote wind farms and wave power units over large distances to consumers. In addition, when energy in electrical form is moved from one location to another there is a loss of energy caused by heat generated during the movement and a degree of dissipation of energy. This will occur on a 24/7 basis. Has this been quantified and included in efficiency calculations? I have seen no evidence of that.

In addition because wave power units are mechanical and located in areas where large waves and swell are common (these being essential to wave powered generation of power), I foresee problems in the future mainly because the units will be susceptible to breakdown and, because breakdowns are likely to be caused by

heavy weather, access by boat or helicopter for repair will be difficult and dangerous and 'down time' frequent.

THE FUTURE:

1. To date, there has been very limited recognition of the potential of tidal power for generation of electricity. In my opinion tidal power has many positive aspects and a limited number of potential difficulties and I propose river Tay has many attributes that make it an ideal test area as well as a strong candidate for major investment to utilise the tides in river Tay for generation of electricity.
2. I strongly maintain recognition must be given to the potential of tidal power for generation of electricity in river Tay and the following points trace some aspects of the history of river Tay and lay out sound bases in support of that initiative in the future.
3. Although that is not the purpose for the current discussion, the message maybe taken as an example of lateral thinking i.e. why not narrow the estuary to increase the rate of tidal flow over a smaller area and therefore make generation of power more efficient and financially attractive.
4. For many years there was an electricity generating station in the harbour at Dundee and the power generated was fed into the national grid via overhead power lines, some of which remain to this day in Greendykes Road. It must be recorded the pylons and equipment may not meet current industry standards, but there is a clear precedent for generation of electricity at Dundee Harbour.
5. Whether reclamation of certain areas of the north and south banks of River Tay would meet ready approval is unlikely, but surely there must be appreciation that reclamation would allow construction of housing and civic facilities close to current urban areas without the overwhelming need to provide new and expensive public transport. This would be much more efficient than looking to build even more housing and related facilities in 'green' countryside.
6. Of advantage to Dundee is the availability of riverside engineering facilities with capacity and experience in construction for the North Sea offshore industry and these could provide skills and experience to the project.
7. Further to these potential areas to be reclaimed from River Tay, the reclaimed land may, in fact, fall to the Crown, but there must be recognition that the land be used for such purposes as sports training, recreation and civic amenities including separate cycle and pedestrian pathways, for example. Perhaps such development would at long last see the return to the people of Dundee and Fife access to the shores of River Tay and recall forgotten uses and aspects of their river.
8. Dundee has two Universities and it is anticipated they would be very interested in this venture and be prepared to apply the skills of their faculties and the potential of their student bodies in architecture, design and materials testing, for example. This could lead to the development and design of an overall concept, with early identification of problem areas and engineering requirements. I propose the

Universities in Dundee be invited to take an active role in finding problems and developing solutions, and to identify industry requirements associated with this project of this scale.

9. Regarding the long term effects of major reclamation in the estuary and river Tay, I recall some years ago staff at one of Dundee's Universities researched changes in the navigation channels in river Tay and the estuary. This is only one example where existing skills and knowledge are available and of value to this project and should be identified and brought to the table.

10. The volume of water flowing into, and ebbing from, river Tay is substantial and, in a quoted statistic is that tidal movement in river Tay has a greater volume of water than the Thames and Severn combined.

11. I anticipate an early assessment will be required to identify the volume of water flowing into, and ebbing from, river Tay and instruments such as flow-meters will be positioned in many locations positions along the river which, over a period of time, would provide that information. These positions could include, for example, some suspended from the Tay railway and road bridges. In addition, there are three rocks close to the Dundee shore just to seaward of the road bridge, named Beacon Rock, Fowler Rock and Caiman's Rock. These rocks are more or less in a north-south line and could also be well utilised to position flow-meters in the assessment period.

Obviously, even an initial assessment phase of this project will need major funding and the complexity of this project is sufficient to require the appointment of a group dedicated to developing an initial profile to ensure the project gets moving. In July 2006, having previously spoken with a reporter, I submitted a similar document to D. C. Thomson, Dundee, but, as that was ignored, D. C. Thomson apparently thought the subject unworthy of the pages of 'The Courier'. In addition, I confirm the above letter and attachments were sent to Lesley Riddoch on 20 October, 2007 but acknowledgement or reply has been not yet received.

Attachments:

Item from Dundee Warder 20 April

1841. Item from Dundee Warder 27

April 1841.

1821 27 APRIL

From Dundee Warder of 27 April 1821

IMPROVEMENTS ON THE NAVIGABLE CHANNEL OF THE FIRTH OF TAY, AS
PROJECTED OPERATIONS ON THE ABERTAY & ELBOW-END SANDS
(By the Author of "Geology as a Science.")

In a preceding number of the *Dundee Warder*, it has already been shown that the tidal-flow up the Frith of Tay is in a great measure co-lineal with its navigable channel. To his correspondency in these two lines may be attributed a degree of freedom from what might be called an absolute bar, like that across the mouth of the river Tyne at Tynemouth Castle. Abertay Sands and Elbow-end may be, however, viewed, as partly a tidal-bar, and a material impediment to the navigation of the Firth of

Tay, occasioned by an advancing tide wave, diverging from its naturally lineal course upon the Sands of Drumly and Monifieth on the north, and upon the Sands of Ferry-Port-on-Craig on the south, or into the bays of Monifieth and Ferry-Port-on-Craig.

We hence observe an obvious defect in the navigable channel at the entrance of the Frith of Tay, which, notwithstanding its depth of water, endangers and obstructs it as an available port of refuge presenting itself to the north sea; and we see also the apparent, if not the absolute, cause of that defect originating in a configuration of the adjacent ground, which spreads out the advancing waters north and south, and disturbs their otherwise lineal and concentrated action.

The importance of preserving a parallelism of the waters of the frith in continuation from Ferry-Port-on-Craig up to Dundee and Newport, and the mistake committed by somebody or other, from easing the pressure of water on the Magdalene Yard, in its relative position to the Harbour and Docks of Dundee, has been previously noticed. Now, a correction of this mistake, and attaining the same equality of channel eastward from Broughty Castle, on the bearings of the Bell Rock Light-house, as prevails westward in the direction of Dundee, are obviously leading objects to be kept in view, so as to cause a form of tidal-action, which, scouring off the Sands of Elbow-end, and also the eastern extremity of the Abertay Sands, would produce a complete fairway from the Bell Rock Lighthouse, bearing immediately upon an unavoidable curvature in the fairway at Dundee.

A tub might float along such a fairway into the Harbour of Dundee, as the only point of land struck into. And a secure haven would be procured, at all times of the tide, if an open-ended break-water, resting on Craig-rock, were made to cover the space of ground from thence up to Magdalene Yard. Such being the distinct objects held in view, we have next to consider the mode and means of effecting these purposes.

As the Bay of Monifieth on the north, in combination with the Bay Ferry-Port-on-Craig on the south, are obviously disturbing causes that give place and being to the Sands of Elbow-end and Abertay, the practability of beaching up these two bays on a line from Buttonness to Broughty Castle on the one side, and from Tentsmuirness to Ferry-Port-on-Craig on the other, must, therefore be considered. Were these purposes achieved, then an advancing tidal-wave might be expected to flow right along upon Dundee Harbour, and scour off all the various impediments to navigation that lie in its direct course.

The prevailing influence of backwater, as it is called, plainly forms the main cause of these respective bays, by a cross current from land-floods repeatedly scouring off a vacant space, which breaks the line of beach and undulates the tidal-flow, until it forms these bays.

On the north, therefore, the first object would be the diversion of Dighty Water, Monifieth Burn, and Buddon Burn, along the line of shore to Broughty Castle, by such effective means as practical engineering can render available, combined with those incidents which concern the project on hand, and which might be advantageously resorted to as a means of expediency, in some measure depending upon that skill and resource in engineering, for which there neither is nor can be any rule but such as depends upon the efficient and practical application of science, combined with judgement and skill, of which the ways and means are many and sure.

A like rule might also be applied in clearing the Bay of Ferry-Port-on-Craig, on the south from all the influence of land-streams. No sooner were Buddon Burn, Monifieth Burn, and Dighty Water, either faggoted, weared, or cut down to Broughty Castle, and secured there, that Drumly Sands, no longer bisected and swept off by back-water, might be confidently expected to run out eastward to Buttonness, when a line of brushwood or furze, covered by stones, might form an out-line of beach, which, gradually raised on a low angle, accordingly as silt accumulated behind this artificial beach, would speedily absorb the Sands of Abertay and Elbow-end, proportionally as these sands were pressed upon and broken up by a flowing tidal-current, until the reclamation of as much as 1600 acres of land from the sea at Monifieth Bay, by the progressive works here suggested, might be fairly estimated upon, and its value applied to defraying the expenses of the project here detailed.

On the side of Ferry-Port-on-Craig, again, by the adoption of like means, as much as 400 acres of land, in addition to the other, might be expected, and finally embanked from the sea altogether.

Now, as the right to so much reclaimed land is unquestionably vested in the Crown, - by Government yielding up that right for the benefit of improving the navigation of the Firth of Tay - and such a concession would neither cost them anything, nor would they relinquish a right of

any value- they would confer on the town of Dundee a most substantial favour, and discharge a duty which Government would be called upon to perform when the terms here stated were properly made to the Queen's Ministers.

Nor is it to be overlooked that this is but the outline of a project based on general principles, along with a mere summary of facts in detail, and applied to a given locality, which a more minute and exact consideration of the premises to be worked upon would be sure to adapt to practical ends.

On the grounds here discussed, and for the reasons already stated, I am not afraid to say that it is practicable to form a deep-water channel, on a direct line of fairway, from the Bell Rock Light-house to the Harbour of Dundee.

By a proper general plan at the outset, and by carefully attending to incidents as they turned out in the progress of the works undertaken, if the entire extent of what I have urged might not be acquired, yet, even realizing one half of the objects here described, would be ample compensation for great exertions made on the part of the town's-people of Dundee. Moreover, a complete remodification of these outlines could not fail in bringing out operations attended with pre-eminent success.