DERBY TIDAL POWER STATION

At the meeting of 4 March 1998, Peter Wood began by giving a general background and discussing the Derby Tidal Power Station proposal. Ian McCardle then followed, speaking on environmental issues.

Peter is from the UK, now settled in Australia. He is a geographer/town planner and was the Director of Planning for the Liverpool region. He became involved in tidal energy by accident because commercial shipping had almost ceased using the Mersey estuary, the source of Liverpool's early prosperity. Planning for the area showed that a barrage built across the mouth of the estuary would reduce the tidal range and make it suitable for recreation while putting turbines in the barrage would create income and help pay for the recreational 'lake'.

Tidal energy creates electricity from the energy of large tidal movements. These huge tides are largely caused by the gravitational pull of the moon and accentuated by the shape of the oceans, the coastline and the seabed. The Bay of Fundy in Nova Scotia, Canada has the largest range of 14 metres; Derby has 10 metres, largest in the tropics; Brittany, France 10 metres, and West UK 10 metres.

The four characteristics of tidal power are:

1. It is a clean source of energy, creating no pollution, thereby helping
2. To reduce greenhouse gas emissions.
3. It is renewable energy, regular and inexhaustible.
4. It is predictable, unlike wind or solar power.
5. It has stability of price and is cheap.

The French in the early 1960s were moving from coal to nuclear power and 40 years ago they built La Rance with a dam across the mouth of the inlet so that the head of water in the dam drives the turbines. It generates 240 megawatts, similar to Collie, is cheap energy and has a life of 120 years. Its method of construction 40 years ago cut off the inlet from the ocean and was an environmental disaster. The University of Dinard has since studied the state of the inlet, which fortunately has now completely recovered. Studies of the Severne and Mersey were very intense - they looked, for example, at the patterns of wading birds in great detail. The conclusions, though the schemes have not yet been built, were that there were potential benefits to the local ecology.

The Kimberley, with its sunken inlets and high tidal range, is the second or third best locality in the world for tidal power generation. John Lewis, a local engineer, presented a paper here in 1963 when Walcott Inlet was one of the areas under consideration. He said there was enough energy in the tides of the Kimberley to

provide electricity for the whole of Australia! This fact is still valid 35- 40 years later although nothing has been done due to the remoteness of the area. In 1990 the WA Parliament set up a select committee to visit Canada, France and the UK. The committee's thorough report assessed the potential of the Kimberley and even suggested converting electricity to hydrogen gas and piping it as far as Sydney.

Doctors Creek has been chosen as the ideal place to build the Derby tidal power station and generate continuous electrical power from the rise and fall of the tides. The creek has two arms, east and west, and they extend about 15 km from the mouth to Derby. Each arm is about ½ km wide. A barrage or dam will be built across the mouth, with sluice gates to allow water in to the high basin (west arm) on the rising tide and water out of the low basin on the falling tide. A channel dug between the two arms will contain turbines to generate electricity that will be carried via transmission lines to Broome, Fitzroy Crossing and Western Metal's new mine at Pillara, just east of Fitzroy Crossing. The dam will also open up other opportunities such as fish farming, prawn farming, recreational fishing, including boat ramps, and tourism. It could become a regional park with a tour-boat linking Derby and the power station. It would be the second largest tidal power plant in the world and the only one able to give continuous power output.

Peter finished his presentation by saying that, while there are native title and heritage issues yet to be solved, construction could be started by about August 1998. This phase would last for 2- 2½ years and, although there will be few jobs associated with the project once it is complete, others will follow on, especially for Aboriginal people.

Ian McCardle is the Manager of Environmental Sciences at Halpern Glick Maunsell, an engineering firm. Like Peter, he has previously spoken to the Derby residents, and his talk covered the overall effect of the construction on the ecology of Doctors Creek.

Macrotidal estuaries are tidally dominated, the water column is completely mixed and there is a high suspended sediment load. Construction of the barrage will change the patterns of water flow. The physical implications are:

1. Current velocities will generally be reduced.
2. Water exchange with King Sound will be reduced by 30% in the high basin.
3. There will be reduced sediment loads.
4. There will be increased light penetration.
5. There will be good water exchange.
6. There will be minimal chance of salinity increases.
7. Flooding of tidal flats will generally be less than at present.

The predicted effects of the altered water exchange, reduced tidal amplitude and reduced current velocities will be a settling of suspended sediments, increased light penetration, less sediment re-suspension and an increase in phytoplankton. The reduced tidal amplitude will result in a loss of mangroves in the short term, and regrowth in areas currently unsuitable in medium term, so there will be a change in mangrove distribution over time. Predicted changes will be an increase in primary production in medium to long term with the changes occurring in an acceptable and manageable manner. One major change in distribution is that there will be a complete loss of mangroves in the low basin and some loss in the high basin with recolonisation of mangroves at the entrance to Doctors Creek and elsewhere in the high basin. Project estimates suggest an initial loss of 1500 hectares of mangroves but eventual regeneration of more than 2000 hectares. There are no species unique to Doctors Creek but there is one rare mangrove which, due to its cryptic nature, is poorly described despite occurring in King Sound and elsewhere in the Kimberley.

Birds of Doctors Creek were surveyed in July 1997 when 41 species were counted; 15 were found to be mangrove restricted, i.e. require mangroves for survival. Broome Observatory counted a further 12 species. Overall, birds make up 89% of the total terrestrial species of Doctors Creek.

An increase in fish numbers is predicted and this will benefit ground feeders and raptors, resulting in change in species composition. Will the main basin act as a fish trap? Fish will be able to exit by the sluice gates, and mesh will exclude larger ones from entering the turbines, so an overall increase in fish numbers is expected. Mud crabs will be unaffected.

An Environmental Management Plan will be developed. The program of research and monitoring will include the establishment of mangroves, mangrove biology research, water quality monitoring, sediment characteristics, presence and quantity of phytoplankton and zooplankton, in-fauna, fish and bird populations.

In the question time that followed, it was admitted that, cost-wise, tidal power could not compete with gas if gas was available in the region. What would be the effect of cyclonic tidal surges? It is very rarely that a cyclone travels down into King Sound, and designs have been based on the probability of such an occurrence in 500 years. Will Derby's fresh ground water become saline? This is highly unlikely but they will establish monitoring bores on the mud flats to check this. Will sandflies and mosquitoes increase? It is unlikely that mosquitoes will increase but the conditions for sandflies will improve. They are expected to be too far away to reach Derby in large numbers. There will be a sedimentation problem, so they will use a small river dredger, electrically driven, working quietly to keep pace with siltation.

The dredged material will be put into deeper holes in the creeks or into King Sound to provide growth banks for mangroves.

On native title and Aboriginal heritage issues the Kimberley Land Council were consulted, also the Aboriginal Affairs Department and the Commission of Elders. Most of the area has been given a clearance following an Aboriginal heritage survey.

The two speakers were thanked in the customary manner for their time and effort and for the clarity of their delivery at the meeting.

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