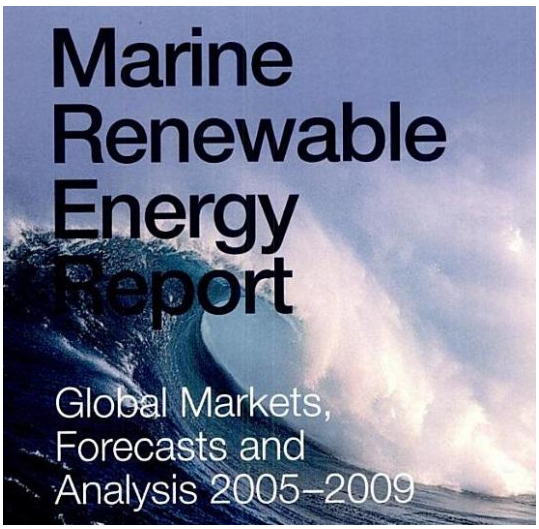


The following appeared on pages 122-124 of the above report

### 4.4.4 The Engineering Business – Stingray

#### *Background*

The Engineering Business Limited (EB) was formed in 1997 and provides design, build and support services for the offshore oil and gas, submarine telecom, defence and renewable offshore power generating industries. EB specialises in providing engineering solutions for the offshore environment.

#### *Technology*

The Stingray consists of a hydroplane which has its attack angle relative to the approaching water stream varied by a simple mechanism. This causes the supporting arm to oscillate which in turn forces hydraulic cylinders to extend and retract. This produces high pressure oil which is used to drive a generator.

#### *Projects*

- **Prototype – Yell Sound, UK:** With financial backing from the DTI Sustainable Energy Technology Programme, EB installed the first Stingray Tidal Stream Generator in 2002. The £1.8 million project installed a 150kW Stingray in Yell Sound in the Shetland Islands, prior to decommissioning and further analysis. This allowed a practical demonstration of the Stingray concept and its power output whilst also allowing EB to test its strategies and systems for installation, maintenance, monitoring, control, power export and decommissioning.

  Stingray was successfully installed on 13 September 2002, then on 25 September EB's launch and recovery system was used to bring it back to the surface at the end of its trial. Stingray was operated in up to 4-knot tidal currents and gathered a huge amount of data. The trial run was deemed a success.

Stingray is fitted with a single 15m hydroplane, with the overall height of the structure being almost 24m. Construction of the demonstrator began in June 2002. Using local North East England-based suppliers, EB subcontracted in excess of 180 tonnes of fabrications. Following inspection and painting the major assemblies were shipped to AMEC's Howdon Supply Base for assembly on the quayside alongside the River Tyne.

The power output results were most encouraging and clearly indicate the ability of Stingray to effectively capture energy from flowing water. Initial power cycle development was with manual control and a peak hydraulic power of 250kW was matched by a time-averaged output of 90kW in a 1.5m/s measured current. The test programme only allowed for a short period to develop the automatic power cycle but a continuous output of 45kW was easily achieved in only two days of development. This was partly limited by an inadequately sized oil reservoir that prevented operation of the machine at full speed. Initial cycle comparisons between the measured characteristics and those predicted by the dynamic model show good agreement. The machine was supposed to give a 150kW continuous output, but that did not happen on this test, although EB is confident that if the trial was not cut short, this would have occurred.

The Stingray was deployed again in the same location in Yell Sound during the summer of 2003 for a month long period. For the 3rd phase of the development programme, additional instrumentation and a more flexible control system was fitted allowing the performance of the generator to be accurately controlled and recorded over an extended period. The test programme was used to optimise the design of Stingray, to undertake durability testing and to verify energy capture.

- **Tidal Farm – location unconfirmed:** The company eventually plans to begin work on a 5 MW Stingray farm connected to the local distribution network. This will involve between five and ten units. All costing to date is on the basis of ten units. No decision has been made on the location of the farm but the Shetlands is a likely choice.

  From the results of the tests on the 150 kW prototype, the design of the next model was refined. The new second generation Stingray will be rated at 500 kW, and will have three hydroplanes instead of the original one blade. The blades would also be able to reverse direction to generate during both the ebb and flood tides. The Stingray will be optimised for tides of between 1m/s–2m/s.

  This improved device will form the basis of a 5 MW offshore 'pre commercial' power station. EB initially estimated yields from the 5 MW farm of £462 000 a year (using electricity price of £60 per MWh). Ten second-generation Stingray devices would be installed.

  Arbuthnot Latham is the corporate financers involved and is looking for partners and investors for the £20 million project. EB have previously thought of listing on the stock exchange to raise capital.

The three year Stingray demonstration programme was completed in the summer of 2004 on time and under budget. EB successfully designed, built, installed, operated and decommissioned the full scale Stingray prototype. Although the device performed better than expected and without any significant problems, EB has decided to put full scale development of the technology on hold.

The next phase of Stingray's development is to build a 5 MW tidal farm, expected to cost more than £20 million to complete. In August 2004, the Engineering Business stated that it could not fund this on its own, and that it was unwilling to start an investment round at the present time. The company does not feel that it can get a satisfactory short-term return from the necessary investment in Stingray in the market at the present time, without firm governmental commitment to tidal (and wave) energy. EB's studies have shown that the cost of generating electricity would be in the range 6.7 p/kWh to 22.2 p/kWh for the farm. This is a wider range, and a higher cost than that predicted by other tide and wave technology developers, but it is based on real experience gained. These prices do not take into account the considerable scope for technology development and cost reduction in the future as the technology is developed and refined.

**– Past and Future Installations**

| | Year Online | Units | MW | Status |
|---|---|---|---|---|
| rototype | 2002 | 1 | 0.15 | Successfully tested |
| rototype | 2006 | 1 | 0.5 | Awaiting stronger market |
| Farm | 2008/9 | 10 | 5 | Awaiting stronger market |