

EXPERT COMMENTS ON THE JUPITER POWER-TAKE-OF SYSTEM

The section below is taken right out of page 12 of the 33 page expert report written by the ORE Catapult. This explains in greater detail how unique our system is and how valid the thinking behind it is as well. They are making it clear that, by going ahead with gearboxes, most of these technologies are ignoring problems which are going to surface and surface in an far more challenging environment than wind turbines-turbulent salt water. This is the main reason that our team from Jupiter is claiming that we have far less to prove than other technologies. Now that we have the Eaton Corporation designing a complete off-the-shelf solution from the end of the screw right through to the grid connection, this de-risks our system even further.

3.1.2.3 The Power-Take-Off

The hydraulic PTO is highly unusual in tidal, but is technically justified. Hydraulics are an excellent way of transforming a high torque/low speed environment into a low torque/high speed one that is suitable for driving conventional 1500/1800 rpm generators. Mechanical gearboxes were a weak link in MW scale wind turbines for many years until the advent of direct drive generators and more recently the introduction of digital displacement hydraulics. Despite this, many tidal turbines have adopted a mechanical gearbox seemingly without examining the wider options.

Hydraulics are adopted widely in wave energy due to high force capability but also due to excellent controllability. Jupiter has not sought to transfer wave-focussed hydraulic technology but has introduced its own ideas, which may have reverse transfer capability.

Catapult assumes that the front-end mechanical to hydraulic power transfer would be achieved by swash plate or bent axis hydraulic motor pumps and that accumulators would be used in the primary circuits to smooth transients and to help in pressure regulation and thus load control of the screws. This is a sound technical approach, well established in wave energy.

The Jupiter proposition is that discretisation of the rear-end PTO into a high number of small switchable units (20 off 50 kW) has advantage over a single (1 MW) hydraulic motor generator.

On the basis that force tends to drive size and thus cost and that smaller machines have no major challenge in operating at high speed, there is some cogency in this approach. Additionally, the stepped approach enables very flexible fixed speed operation of the generators and thus the avoidance of power electronic converters. Production of grid quality, clean AC enables much easier power collection in array. There is thus a good technical basis for the system, albeit that validation of cost benefits will require front-end engineering design (FEED) studies.