Landing Platform Docks
HMS ALBION and HMS BULWARK
First HV & Full Electric Propulsion for the Royal Navy

The Albion Class Landing Platform Docks (LPDs) primary role is to embark, transport, deploy and recover troops, their equipment and vehicles by air and sea, and form part of the Amphibious Assault Capability for the Royal Navy. These large ships are the first full electric propulsion vessels built for the Royal Navy, and at the same time with a distribution system at 6600 V they are the first high voltage ships in the Fleet.

The Albion Class vessels are the first all-electric ships built for the Navy replacing HMS Fearless and HMS Intrepid, the last steam powered ships in the fleet, built in the early 1960s and veterans of the Falklands conflict.

GE’s Power Conversion business were involved throughout the project from the early stages of studies, through design, build and commissioning and into after sales service.

These long awaited replacements was initially designed for mechanical propulsion, but part way through the design process, the decision was made to adopt full electric propulsion.

Power Conversion worked with the shipyard to provide an Electric Propulsion system that would fit within the existing mechanical hull design and this became the baseline proposal.

Shortly after the main ship award in 1995, Power Conversion was awarded the power and propulsion system contract, including the prime movers, by Vickers Shipbuilding in Barrow, now part of BAE Systems. The architecture offered was similar to commercial Power Conversion designs for offshore vessels. Although having a different shaft line and prime mover arrangement, it used the same equipment and technology as the system for the Auxiliary Oilers, a contract which ran in parallel.

Power Conversion set up a common team for the Landing Platform Dock (LPDs) and Auxiliary Oilers (AOs) in Rugby which struck up a close working relationship with the shipyard team which continued in all phases of the job, including placing Power Conversion personnel in the design team up at Barrow for periods of time. Power Conversion was the power and propulsion contractor responsible for the whole HV system. The single line diagram shows the system, with two main and two auxiliary generators, three 6.6 kV high voltage switchboards, fwd, mid and aft. The large Generators and propulsion feeds are split across the mid and aft boards, with the forward board containing the two main auxiliary diesel generators and one of the large ship services transformers.

The slightly unusual arrangement of two large and two small diesel engines, compared with four plus one on the AOs for example, was fundamentally driven by the change from mechanical to electric propulsion, with the two main sets replacing the direct drive propulsion diesels, and the two auxiliary sets replacing the small ship services engines. This can clearly be seen in the final machinery layout where main engines and propulsion motors are co-located at the ends of the propulsion shafts. From a power and propulsion perspective, there are many firsts on this ship for the Royal Navy: the first Full Electric Ship, the first High Voltage at sea, and the first adoption of a modified commercial electric drive system for a Royal Navy vessel. Military modification to the commercial equipment was principally in areas of shock and quality of power supply.

HMS Albion and HMS Bulwark were both built at Barrow with HMS Albion given a royal dynamic launch in March 2001 by HRH Princess Anne and HMS Bulwark following in November of the same year.
Power Conversion undertook all the power and propulsion plant commissioning and attended the first of class sea trials on Albion in December 2002 and Bulwark in May 2004.

The electric propulsion system reduces the number of marine engineering personnel by nearly two thirds compared the previous LPDs, with the overall ships company reduced through this and other new technologies by around 40% from the previous class for a considerably larger and more capable ship.

**Key Facts**

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<th>OPERATOR</th>
<th>Royal Navy</th>
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<tbody>
<tr>
<td>SHIPYARD</td>
<td>BAE Systems</td>
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<td>IN SERVICE</td>
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<tr>
<td>LENGTH</td>
<td>176 M</td>
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<td>DISPLACEMENT</td>
<td>18500 T</td>
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**Complete Power and Propulsion**

- 3 x 6.6 kV MV Switchboards
- 2 x 6.25 MW Generators
- 2 x Wartsila 16V32E Diesels
- 2 x 1.5 MW Generators
- 2 x Wartsila 4632E Diesels
- 2 x 6.6 kVA/440 V Ship Services Tx
- 2 x 6 MW LCI Main Propulsion
- 2 x Conventional shaftlines
- 12 Pulse Transformer Fed
- 2 x Harmonic Filters
- 1 x 6.6 kV DOL Bow Thruster

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