

**Title:** Onboard DC Grid for Enhanced DP Operation in Ships

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**Abstract**

Onboard DC Grid is a novel, new technology which is a further development of utilizing DC links that already exists in all propulsion and thruster drives, accomplishing for usually more than 80% of the electrical power consumption on electric propulsion vessels. This extension means that we keep all the good and well proven products used in today's electric ships like AC generators, inverter modules, AC motors, etc. The main AC switchboard and transformers are not longer needed. The result is a more flexible power and propulsion system. Further Onboard DC Grid enables a combination of power sources and energy storage. Onboard DC Grid is suitable for vessels with total installed power of up to 20MW and operates at 1000V DC on the main bus.

Typical target vessel is Offshore Support Vessels (OSVs), but any other vessel type using low voltage electric distribution would also be in the target range.

For DP operation this approach gives several benefits. Firstly, the power network is no longer fixed at 60Hz. This means that an additional freedom of controlling the generator engine speed is present, giving the possibility to run engines efficiently even at 50% loading or lower. Today's discussion of operating the power plant with open or closed busbar breakers can then be closed.

Secondly, use of energy storage gives a possibility to level out the power variations on the engines even if the thruster loads are varying significantly due to vessel movements in bad weather conditions. This does not only contribute to increased fuel saving, but equally important would be the increased DP performance by the fact that the dynamic response of the thrusters would be independent from the engine dynamics. Today each thruster will experience ramp limits in power changes due to limitations in engines, however the energy storage take most of these power variations and hence reduce these limitations to a minimum.

To conclude Onboard DC Grid is suited for vessels with total installed power up to about 20MW. It is flexible with respect to use of various power and fuel sources, and it gives clear benefits for vessels operating in DP, with respect to fuel consumption but also with respect to dynamic performance of the thruster system.

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