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# Classifying the Innovation: The Certification of New Designs for Power Generation, Conversion and Energy Storage Focusing on the Reduction of Ships Emissions

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In recent times the ship building and yacht industries have seen a surge in the requests for the application to the power generation, conversion and energy storage of technologies which were previously reserved to land-based uses or to niche sectors such as space, military, and scientific research. Such requests are often driven by seeking cleaner exhaust emissions, more efficient fuel consumption and higher passenger and crew comfort. Among these novel technologies we can mention fuel cells and (large) batteries based on Li-ion chemistries. These solutions are not only unconventional per se, they also carry along the necessity for advanced electrical system integration (even more so if combined in a hybrid architecture) or, for fuel cells, the need for the storage of dedicated fuels, e.g. liquid or compressed hydrogen or methanol, and fuel treatment, e.g. evaporators and chemical reformers. The lack of prescriptive regulations covering such innovative solutions, both in terms of equipment and fuel, adds in challenge to their acceptance and certification from Regulatory Bodies and Flag Administrations. Furthermore, although high-level guidelines are provided, they often need to be tailored on a case-by-case basis and integrated with risk assessment exercises. The aim of this work is to give a comprehensive overview of the Classification tools available to date – be it prescriptive or risk-based – for the approval of novel designs and how do they relate to the existing statutory guidelines and to the established risk analysis instruments. The discussion will be corroborated by insights into some hands-on case studies in the yacht and cruise ship industry segments.

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